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ABSTRACT

This volume, the second of a two part evaluation report, is devoted exclusively to the presentation of detailed course outlines representing an Animal Science Technology curriculum. Arranged in 6 terms of study (2 academic years), outlines are included on such topics as: (1) Introductory Animal Science, (2) General Microbiology, (3) Zoonoses, (4) Animal Reproduction, (5) Clinical Management, (6) Animal Parasitology, (7) Animal Nutrition, (8) Genetics, and (9) Technical Reporting. Each outline includes estimated instruction time, a lesson description, and reference materials. It should be noted that the establishment of the first year of this curriculum assumes a common core to be taken by all students during the first 3 terms of the program. The second year is characterized by a modified core approach, whereby a reduced number of required courses allow for the selection, by the students, of one of the two option areas; namely, the Laboratory Animal Option or the Veterinary Assisting Option. Volume I of this report, the description and evaluation of the program, is available as VT 013 804. (Author/JS)

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ANIMAL SCIENCE TECHNOLOGY

An Experimental Developmental Program

VOLUME II

Curriculum Course Outlines

This program of development in the field of Animal Science Technology was completed by the State University of New York Agricultural and Technical College at Delhi, New York, pursuant to Contract No. OE-5-85-076 with the Office of Education.

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Division of Comprehensive and
Vocational Education
National Center for Educational
Research and Development
U. S. Office of Education
Washington, D. C. 20202

VT 013 905

VOLUME II

INTRODUCTION TO COURSE OUTLINES

This volume is devoted exclusively to the presentation of detailed course outlines representing the Animal Science Technology curriculum at Delhi.

During the period encompassing the development of this program, the academic year at Delhi was organized on a term basis (three terms constituting the academic year). The design to be followed in the presentation of material in this volume will reflect the term format.

Establishment of the first year of this curriculum is predicated on the basis of a common core (animal science as well as general education courses), to be taken by all students during the first three terms of the program. The second year is characterized by a modified core approach, whereby a reduced number of required courses (particularly in the fifth and sixth terms) allow for the selection, by the students, of one of the two option areas; namely, the Laboratory Animal Option or the Veterinary Assisting Option. Additional flexibility is programmed into the curriculum by encouraging students, while completing "specific option" requirements, to also select limited courses from the "Unclassified Electives" category and/or from the second option.

This additional background in technical courses (where desired) expands the employment opportunities and career potential for the animal science graduate.

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ANIMAL SCIENCE TECHNOLOGY CURRICULUM

FIRST TERM COURSE SCHEDULE

Introductory Animal Science 2
Medical Terminology 10
Freshman Mathematics 20
General Microbiology 25
Introductory Chemistry I 50
Physical Education I (New York State Graduation Requirement)

INTRODUCTORY ANIMAL SCIENCE

HOURS REQUIRED

Class, 2; Laboratory, 2.

DESCRIPTION

A fundamental course in Animal Science structured to establish a general background for the beginning student in the area of agricultural, veterinary and laboratory animal science. In effectively accomplishing this objective, the course in designed to include both lectures and laboratory exercises which will introduce simultaneously the technological and functional aspects of the animal science field. Topical consideration will include, in part, animal classification; the care and behavioral characteristics of domestic, companion and laboratory animals; breeding, physiological function and growth of various types of animals; the effects of environment and ecological stresses on selected species. Emphasis in this course also includes an introduction to and discussion of the "scientific method" as it relates to animal science.

The laboratory exercises designed for inclusion in this course are primarily of the "demonstration type" and are intended to broadly and effectively supplement the lecture topics and provide the student with a conceptual understanding of the technological area in which he has chosen to be educated.

This course is included in the curriculum of the beginning student as a means of developing a sound basis for future specialized courses in the field of Animal Science Technology.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Introduction to Animal Science	2	1
II.	Introduction to Animal Breeds	3	1
III.	Animal Restraint	2	1
IV.	Animal Care	2	1
V.	Animal Behavior	3	1
VI.	Animal Selection	3	3
VII.	Principles of Selection and Mating of Animals	1	1
VIII.	Physiology of Growth and Senescence . .	3	1
IX.	Ecology and Environmental Physiology .	2	0
X.	Orientation Relating to Animal Science Technology and other Curricular areas within the Agricultural Division . .	1	1
	Totals	22	11

I. INTRODUCTION TO ANIMAL SCIENCE

Units of Instruction

1. Explanation of areas of Animal Science specialization
2. Opportunities for employment

Laboratory Projects

1. Tour of College farm facility

II. INTRODUCTION TO ANIMAL BREEDS

Units of Instruction

1. Beef cattle
2. Dairy cattle
3. Horses, Swine and Sheep
4. Breeds of companion and pet animals
5. Breeds of laboratory animals

Laboratory Projects

1. Introduction to breeds of domestic animals at the College farm
2. Introduction to breeds of laboratory animals at the animal science vivarium

III. ANIMAL RESTRAINT

Units of Instruction

1. Purpose of animal restraint
2. Methods of animal restraint

Laboratory Projects

1. Demonstration of animal restraint
    - a) Cows
    - b) Horses
    - c) Dogs
    - d) Cats
    - e) Small laboratory rodents

IV. ANIMAL CARE

Units of Instruction

1. Feeding
2. Husbandry

3. Sanitation
4. Housing
5. Grooming and clipping

Laboratory Projects

1. Demonstrations of foot care and grooming on cows and horses
2. Physical examination (demonstration by veterinarians) of a large domestic animal (horse or cow)

V. ANIMAL BEHAVIOR

Units of Instruction

1. Normal animal behavioral studies
2. Description of patterns of animal behavior
3. Abnormal behavior in animals

Laboratory Projects

1. Student researches a pattern or aspect of animal behavior and prepares a written report

VI. ANIMAL SELECTION

Units of Instruction

1. Purpose of animal selection
2. Principles of animal selection
    a) Introduction to genetics
3. Production records, pedigree, phenotype correlated to animal selection

Laboratory Project

1. Judging demonstration and method
    a) Dairy cattle
    b) Beef cattle
    c) Horses

VII. PRINCIPLES OF SELECTION AND MATING OF ANIMALS

Units of Instruction

1. Phenotype correlation of parent animals to produce a desirable offspring

Laboratory Projects

1. Artificial insemination demonstration

VIII. PHYSIOLOGY OF GROWTH AND SENESCENCE

Units of Instruction

1. The phenomenon of growth
2. The cell as a unit of growth
3. Hormonal control of growth
4. Nutrition and growth

Laboratory Projects

1. Film series relating to nutritional deficiencies in animals

IX. ECOLOGY AND ENVIRONMENTAL PHYSIOLOGY

Units of Instruction

1. Adaptation to environment
    a) Comparison of climatic adaptive physiology
2. Body temperature regulating mechanisms
3. Heat dissipation
4. Effects of climate on production

Laboratory Projects

1. No laboratory project for this topical area.

X. ORIENTATION RELATING TO ANIMAL SCIENCE TECHNOLOGY AND OTHER CURRICULAR AREAS WITHIN THE AGRICULTURAL DIVISION

Units of Instruction

1. General content of curricular offerings

Laboratory Projects

1. Brief indoctrination by Agricultural Division Staff to curricular areas and career opportunities representative of the agricultural and animal science field.

REFERENCES

Campbell, b. and R. Lasley. The Science That Serves Mankind.
Cole, W. Livestock Production.
Ensminger, M. E. Animal Science.
Garrigus, W. P. Introductory Animal Science
Hafez, E. S. E. Adaptation of Domestic Animals.
Harrison, E. S. and H. A. Strohmyer Dairy Cattle Judging.
Kammlade, W. G. Sheep Science.
Snyder, L. H. Principals of Heredity.
Winchester, A. M. Genetics.

INSTRUCTIONAL MEDIA

Abbott Laboratories Film Service Department, North Chicago,
Illinois 600605

Cell Division and Growth, 16 mm., 13 min., sound, black and white.

Compresses several days of cell growth into a few minutes. Pictured activity of living tumor cells are seen moving in ameboid fashion, growing, aligning chromosomes and dividing at maturity.

Encyclopaedia Britannica Educational Corporation, 1822 Pickwick Avenue, Glenview, Illinois. 60025.

Control of Body Temperature. 16 mm., 11 min., sound, black and white.

Contrasts constant temperatures of warm blooded animals with fluctuating temperatures of cold blooded ones. Reveals the relationship of body heat to energy furnished by foods. Depicts the blood stream as a heat distributor.

Lederle Laboratories Film Library, Lederle Laboratories, Pearl River, New York.

Vitamins and Some Deficiency Diseases. 16 mm., 35 min., sound, color.

Laboratory scenes depict vitamin deficiencies in experimental animals including vitamins A, B, C, D, E, K and B complex.

McGraw-Hill Book Company, Film-Text Division, 327 West 41st Street, New York, New York 10036

Behavior. 16 mm., 28 min., sound, color

Illustrates difference between instinctive and learned behavior. Describes relation between instinct intelligence and learning and the advantages and disadvantages of these different characteristics.

The Animal And The Environment. 16 mm., 28 min., sound, color.

Discusses regulatory devices, describes the process of breathing. The heartbeat and kidney functions are examples of regulating mechanisms.

Maryland Society for Medical Research, 522 West Lombard Street, Baltimore, Maryland. 21201

The Avitaminosis. 35 mm. (2"x 2")color slides (54 in set), complete with booklet commentary.

Color slides show the results of vitamin deficiency experiments on animals and linical observation on man.

Psychological Cinema Register, Audio Visual Aids Library, Pennsylvania State University, University Park, Pennsylvania.

Social Behavior of Rhesus Monkeys. 16 mm., 26 min., sound, black and white.

Large numbers of rhesus monkeys living in semi-natural environment, shown with special emphasis on social interactions both of individuals and of organized groups. Interactions illustrated: male-female; female-young; male-male; female-female; young-young and male-young. Behavior shown includes reproductive, maternal, dominance, fighting, play and general.

MEDICAL TERMINOLOGY

HOURS REQUIRED

Class, 1; Laboratory, none

DESCRIPTION

A first term course designed to introduce Animal Science Technology students to the professional language of the Veterinary and Bio-Medical Field. Since the understanding and carrying out of instructions given in a hospital or medical laboratory requires exact communication, the mastery of medical terminology is essential. Completion of this course provides the student a base upon which to build his professional vocabulary in advanced technical courses.

The primary objective of this course, therefore, is to help the student develop the ability to read and understand the language of medicine. An effort is made to promote a knowledge of the elements of medical terms, an understanding of standard medical abbreviations, the ability to spell medical terms, and an appreciation of the logical method found in medical terminology. Emphasis is placed on the meaning of word roots and combining forms rather than stressing word etymology.

Students are encouraged to acquire and make frequent use of a medical dictionary during their study. Diagrams, 2 x 2 colored slides and all other visual aids available will be utilized to help illustrate and make terms more understandable when this is possible. Outside reading and writing assignments may be made to give students practice in the use of the medical terms presented.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. Introduction to Medical Terminology	1/2	None
II. Study of Word Elements	1 1/2	
III. Examples of Word Analysis and Definition	2	
IV. Study of Selected Medical Terms From the Animal Science Field	6	
V. Class Term Papers Incorporating the Use of a Maximum Number of Medical Terms	1	
Totals	11	0

I. INTRODUCTION TO MEDICAL TERMINOLOGY

Units of Instruction

1. Importance and usage of medical terms
2. Etymology - definition of
3. Languages from which medical terms take their root
4. Pronunciation
    a. Key to pronunciations
    b. Unusual pronunciations of some initial consonants
5. Terms which require special consideration
    a. According to source of components

b. Formation of Latin derived plurals

c. Greek plurals

II. STUDY OF WORD ELEMENTS

Units of Instruction

1. Classes of word elements
    a. Prefix
        1) Definition
        2) Examples
    b. Suffix
        1) Definition
        2) Examples
    c. Word stems
        1) Definition
        2) Examples
2. How word elements are combined
    a. Euphony
    b. Rules of thumb for word element combining
        1) A vowel ending and a consonant beginning or vice versa
        2) A vowel is followed by an element beginning with rh
        3) One element ends in a vowel and the next one begins with a vowel also
        4) One element ends with a consonant and the next element begins with a consonant
3. Special caution on word elements that look alike, or sound alike, but have different meanings

4. Identical word stems that are derived from different words and/or language derivation
5. Terms whose literal translation needs more explanation

III. EXAMPLES OF WORD ANALYSIS AND DEFINITION

Suffix	Term	Analysis	Definition
-cele (G) hernia protrusion	cystocele	Kystis: bladder	hernia of bladder
-emia (G) blood	hyperglycemia	yper: excessive glykos: sweet, sugar	abnormally high blood sugar
-itis (G) inflammation	carditis	Kardia:heart itis:inflammation	inflammation of heart
-oma (G) tumor	adenoma	aden:gland oma:tumor	glandular tumor
-rhexis (G) rupture	angiorrhexis	aggeion: blood vessel rexis: rupture	rupture of a blood vessel
-ectomy (G) excision	oophorectomy tonsillectomy	oophor: ovary tonsilla: tonsil	removal of an ovary removal of tonsils
-lithotomy (G) incision for, removal of stones	nephrolithotomy	nephros: kidney	incision into kidney for removal of stones
-tomy (G) incision into	thoracotomy	thorax: chest	Opening of the chest

Root	Term	Analysis	Definition
aer- (G) air	aerobic	bios:life	pertaining to organism which lives only in the presence of air
arth- (G) joint	arthralgia arthritis	arthon:joint algos:pain itis: inflammation	pain in the joints. inflammation of the joints

Root	Term	Analysis	Definition
cephal- (G) head	cephalic cephalitis	kephale:head ic:pertaining to itis:inflammation	pertaining to the head inflammation of the brain
derm- (G) skin	dermatitis dermal	derma:skin itis: inflammation al:relating to	inflammation of the skin relating to the skin
hemat- (G) blood	hematoma	oma:tumor	a blood tumor
leuk- (G) white	leukemia	leukos:white aima:blood	disease characterized by an extremely high white count
pyo (G) pus	pyogenic	pyon:pus genesis: formation	pus forming
viscer (L) organ	visceral	viscus:organ al:pertaining to	pertaining to the internal organs

Prefixes	Term	Analysis	Definition
ab- (L) from, away from	abductor	ab:away from ductor:that which draws	That which draws away from a common center, as a muscle
anti- (G) against	antitoxin	anti:against toxikon:poison	A protein that defends the body against a toxin
endo- (G) within	endocardium endocarditis	endon:within Kardia:heart itis:inflammation	lining membrane of inner surface of the heart Inflammation of the endocardium
hyper- (G) above, excessive, beyond	hyperemia	hyper: excessive	congestion
peri- (G) around about	periosteum periostitis	peri:around osteon:bone itis: inflammation	the membrane that invests and nourishes the bone. Inflammation of the periosteum

Prefixes	Term	Analysis	Definition
pro- (L,G) in front of before, forward.	prolapse	pro:forward lapsus:slide	a downward displacement of an organ, as the rectum or the uterus
semi- (L) half	semilunar valves	semi:half valva:one leaf of a double door	Half-moon shaped valves of the aorta and pulmonary arteries
trans- (L) across, over	transfusion	trans:across fusio:a pouring	Injection of the blood of one person into the blood vessels of another

IV. STUDY OF SELECTED MEDICAL TERMS FROM THE ANIMAL SCIENCE FIELD

Units of Instruction

1. Anatomy
    a. Positional and directional
        1) afferent
        2) distal
        3) caudal
        4) lateral
        5) medial
        6) proximal
        7) superficial
        8) cranial
    b. Body planes
        1) frontal
        2) median
        3) sagittal
        4) transverse

c. General

1) aorta
2) apex
3) atrium
4) capillary
5) cardiac
6) cervical
7) coccygeal
8) diaphragm
9) endothelium
10) epiphysis
11) esophagus
12) fascia
13) gall bladder
14) inguinal
15) lumbar
16) lymph
17) osseous
18) pancreas
19) pleura
20) prescapular
21) radius
22) sternum
23) subcutaneous
24) tendon
25) vein

2. Physiology

a. conception
b. corticosteroid
c. dehydration
d. embryo
e. enzyme
f. fetus
g. F. S. H.
h. glycogen
i. herbivorous
j. involuntary muscle
k. milk let-down
l. parenchymal
m. parturition
n. peritoneum
o. ruminant
p. serous
q. testosterone
r. thyroid

3. Pathology
    a. acute
    b. ascites
    c. atrophy
    d. benign
    e. cachexia
    f. chronic
    g. cirrhosis
    h. congestion
    i. edema
    j. endocarditis
    k. exudate
    l. fistula
    m. hepatitis
    n. icterus
    o. inflammation
    p. leukemia
    q. lymphoma
    r. malignant
    s. necropsy
    t. pathogenic
    u. pneumonia
    v. vigor mortis
    w. septicemia
    x. sinusitis
    y. toxemia
    z. tumor
4. Parasitology and Zoonoses
    a. actinomycosis
    b. ascariasis
    c. brucellosis
    d. cysticercus bovis
    e. demodex folliculorum
    f. diamond skin disease
    g. echinococcus
    h. epidemic
    i. flukes
    j. gid
    k. hypoderma bovis
    l. infectious
    m. leptospirosis
    n. mange
    o. "Measles" (beef)
    p. piroplasmosis
    q. rabies
    r. scabies
    s. taenia
    t. trichina

5. Anesthesiology, Surgery and Radiology

a. anesthetic accident
b. angiotribe
c. anode
d. anoxia
e. barbiturates
f. cassette
g. diabutol
h. endocrinectomy
i. endotracheal catheter
j. euthanasia
k. gastrotomy
l. hyperventilation
m. incision
n. intensifying screen
o. laryngospasm
p. metafane
q. ovariohysterectomy
r. preanesthetic
s. roentgen ray
t. safelite
u. suture
v. ventriculo-chordectomy
w. X-radiation

6. Meat and Food Inspection

a. abomasum
b. adhesion
c. ante-mortem
d. bob-veal
e. bone-sour
f. bovine
g. brisket
h. carotenosis
i. casings
j. comatose
k. condemned
l. contagious
m. downers
n. evisceration
o. freezer burn
p. honeycomb
q. mastitis
r. meat by-products
s. offal
t. "picnic" (swine)
u. reactor
v. salami
w. silent cutter
x. steer
y. sweetbread
z. tripe

V. COURSE TERM PAPER

Units of Instruction

1. Topic to be at the discretion of the students special interest
2. Paper must incorporate the use of a maximum number of medical terms (Number to be determined by instructor) from those presented during the course.

REFERENCES

Asimov, Isaac, et. al. Stedman's Medical Dictionary.

Bollo, Louise E. Introduction to Medicine and Medical Terminology.

Frenay, S.M.A.C. Understanding Medical Terminology.

Hoerr, N. L. and Osol, A. Blakiston's New Gould Medical Dictionary

FRESHMAN MATHEMATICS (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 3; Laboratory, 0.

DESCRIPTION

An introductory course structured to provide the student with a background in mathematics sufficient to comprehend the basic concepts and principles which relate to the technical courses in this curriculum.

In establishing a functional understanding of this subject the student will be expected to complete practical problems and exercises relating to basic mathematics and the operational aspects of basic algebra.

Fundamental concepts relating to real number systems, properties of numbers, laws of exponents, linear equations, application of algebraic techniques to solution of word problems, will be established.

MAJOR DIVISIONS

		Class Hours
I.	Algebraic Concepts and Operations Involving Sets of Integers	6
II.	Algebraic Concepts and Operations Involving the Set of Rational Numbers	8
III.	Linear Equations	8
IV.	Special Products and Factoring	6

	Class Hours
V. Irrational Numbers, Fractional Exponents and Radicals	5
Total	33

I. ALGEBRAIC CONCEPTS AND OPERATIONS INVOLVING THE SET OF INTEGERS

Units of Instruction

1. The Natural Numbers
    - a. The Hindu-Arabic number system
    - b. Other number bases
    - c. The operations of arithmetic
    - d. Prime and composite numbers
2. The Negative Integers and Zero
    - a. Operations involving signed numbers
    - b. Literal expressions
    - c. Equations and identities
    - d. Equations with integral solutions
    - e. Substitution
    - f. Simple word problems involving integral answers

II. ALGEBRAIC CONCEPTS AND OPERATIONS INVOLVING THE SET OF RATIONAL NUMBERS

Units of Instruction

1. The Rational Numbers
    - a. The rational operations of arithmetic (signed numbers)
    - b. Rational operations of arithmetic on literal monomial expressions

- c. Reduction and transformation of fractions
- d. LCD and LCM
- e. Finding the prime factors of numbers
- f. Definition of exponent and base
- g. Equations yielding rational solutions
- h. Word problems involving rational number answers
- i. Reciprocals of rational numbers
- j. Equations with rational coefficients

2. Operations with Rational Nomonial and Polynomial Expressions
    - a. Operations with monomials (addition and subtraction)
    - b. Laws for positive integral exponents
    - c. Laws for integral exponent
    - d. The zero exponent
    - e. Operations with monomials (multiplication and division)
    - f. Addition and subtraction of polynomial expressions
    - g. Symbols of grouping
    - h. Multiplication and division of polynomial expressions

II. LINEAR EQUATIONS

Units of Instruction

1. Relations
    - a. Means of expressing a relation
    - b. The linear equation as a relation
    - c. The graph of a relation

        - d. The zero values of equation relations
        - e. The intersection of two or three linear equation relations
        - f. Linear equation relations with all or no common elements
    - 2. Fractional Equations
        - a. Technique for solving
        - b. Values for which the equation may be undefined

IV. SPECIAL PRODUCTS AND FACTORING

Units of Instruction

- 1. Special Products
    - a. Perfect squares
    - b. Product of the sum and difference of two numbers
    - c. Expanding binomials
    - d. Pascal's triangle
- 2. Factoring
    - a. Factoring common terms or expressions
    - b. Factoring perfect square
    - c. Factoring the difference between two squares
    - d. Factoring the sum and difference between two cubes

V. IRRATIONAL NUMBERS, FRACTIONAL EXPONENTS AND RADICALS

Units of Instruction

- 1. Irrational Numbers
    - a. Decimal form
    - b. Radical form

2. Fractional Exponents
    a. Laws of exponents for rational exponents
    b. The relationship between roots and powers
3. Radicals
    a. Interconversion between exponent form and radical form
    b. Operations with radicals
    c. Roots of negative numbers

TEXT

Roberts, H. M. and D. S. Richardson. Elements of Mathematics.

REFERENCES

Comant, R. and H. Robbins. What is Mathematics.
James, G. and R. C. James. Mathematical Dictionary.
Western, D. W. and V. H. Haag. Introduction to Mathematics.

GENERAL MICROBIOLOGY (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 3; Laboratory, 3.

DESCRIPTION

An introductory course in microbiology structured to familiarize the student with the characteristics of bacteria, viruses, fungi and protozoa, particularly as they relate to man's environment. In achieving the objectives of this course the student will become familiar with the classification, identification, culture and control of the most common microbial species of concern in public health and industry. Techniques essential to the accomplishment of course objectives are developed by the individual student in the laboratory sessions.

Small laboratory sections of not more than twenty students are recommended in order to assure a maximum learning experience for the individual student.

Additional time outside the regularly scheduled laboratory periods will be required for transferring of cultures and determination of results at the conclusion of several of the laboratory exercises.

This course is a required prerequisite for the advanced course in Applied Microbiology.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Scope of Microbiology	2	Lectures and Laboratory sessions not coordinated. Laboratory exercises enumerated following lecture outline
II.	History and Development of Microbiology	2	
III.	Microbial Taxonomy	1	
IV.	Microscopy and Staining	2	
V.	Anatomy and Cultivation of Bacteria	2	
VI.	Reproduction and Growth	2	
VII.	Enzymes	2	
VIII.	Bacterial Metabolism	1 1/2	
IX.	Bacterial Genetics	2	
X.	Orders of Bacteria	2	
XI.	The Fungi-Molds	1	
XII.	Yeasts	2	
XIII.	Rickettsiae and Algae	1	
XIV.	Protozoa	1	
XV.	Viruses	2	
XVI.	Control of Microorganisms	1	
XVII.	Antibiotics and Chemotherapeutic Agents	1 1/2	
XVIII.	Pathogens Virulence and Infection	1	
XIX.	Resistance and Immunity	1	
XX.	Selected Areas of Application of Microbiology	3	
	Totals	33	11

I. SCOPE OF MICROBIOLOGY

Units of Instruction

1. Unit Objectives
    - a. To develop within students an awareness of the various microorganisms
    - b. To enable students to understand the importance of microorganisms to mankind
    - c. To enable students to apply knowledge of microorganisms to phenomena in every day life.
2. Unit Content
    - a. Identification of Microbiology
        1. The science of Microbiology
        2. Characteristics of living things
    - b. The protista
        1. Procaryota
        2. Eucaryota
    - c. Groups of Microorganisms
        1. Algae
        2. Bacteria
        3. Fungi
        4. Protozoa
        5. Rickettsiae
        6. Viruses
    - d. Areas of Microbiology
        1. Agricultural Microbiology
        2. Industrial Microbiology
        3. Medical Microbiology

4. Space Microbiology

5. Biological Warfare

II. HISTORY AND DEVELOPMENT OF MICROBIOLOGY

Units of Instruction

1. Unit Objectives
   - a. To make students aware of developments in microbiology
   - b. To give students an understanding of how developments in microbiology took place
   - c. To enable students to apply knowledge of the development of microbiology to current life and practices.
2. Unit Content
   - a. History and Development of Microbiology
     - 1) The Microscope
     - 2) Spontaneous generation and biogenesis
     - 3) The germ theory of disease
     - 4) Koch's postulates
     - 5) Development of vaccines
     - 6) Development of antibiotics

III. MICROBIAL TAXONOMY

Units of Instruction

1. Unit Objectives
   - a. To make students aware of the manner by which microorganisms are classified
   - b. To impart to students the criteria upon which classification is based

- c. To enable students to apply knowledge of classification to unknown organisms

2. Unit Content
   - a. Scientific classification
     - 1) Nomenclature
     - 2) Taxonomy
     - 3) Binomial nomenclature
     - 4) Taxa
     - 5) Bases for nomenclature and classification of microorganisms

IV. MICROSCOPY AND STAINING

Units of Instruction

1. Unit Objectives
   - a. To develop within students an awareness of the importance of the microscope and staining techniques to microbiology
   - b. To give students a knowledge of the components of the microscope and staining techniques
   - c. To impart to students how to stain microorganisms and view them under the microscope
2. Unit Content
   - a. Microscopes and Microscopy
     - 1) Types of Microscopes
       - a) Bright-field
       - b) Dark-field
       - c) Ultraviolet
       - d) Fluoresence

        - e) Phase-contrast
        - f) Electron
      - 2) Functioning of a Microscope
    - b. Staining
      - 1) Preparation of a smear
      - 2) Simple stains
        - a) basic stain
        - b) acidic stain
        - c) neutral stain
      - 3) Differential stain
        - a) gram stain
          - (1) theories on gram reactions
        - b) Endospore stain

V. ANATOMY AND CULTIVATION OF BACTERIA

Units of Instruction

- 1. Unit Objectives
  - a. To develop within students an awareness of the anatomical and cultural characteristics of bacteria
  - b. To enable students to understand various requirements for the growth of bacteria
  - c. To enable students to grow bacteria in the lab
- 2. Unit Content
  - a. Anatomy of bacteria
    - 1) Cocci
      - a) Diplococci
      - b) Streptococci

            c) Tetrads
            d) Staphylococci
            e) Sarcina
        2) Bacilli
            a) Diplobacilli
            b) Streptobacilli
        3) Spirilla
    b. Size of bacterial cells
    c. Bacterial structures
        1) Fimbria
        2) Capsule
        3) Wall
        4) Cytoplasmic membrane
        5) Nuclear substance
        6) Cytoplasm
        7) Ribosomes
        8) Flagellum
        9) Basal Granule
    d. Cultivation of bacteria
        1) Nutritional requirements
            a) Autotrophs
            b) Heterotrophs
        2) Bacteriological media
        3) Physical conditions required for growth
            a) Temperature
            b) Gaseous requirements
            c) pH

VI. REPRODUCTION AND GROWTH

Units of Instruction

1. Unit Objectives
    - a. To develop within students an awareness of the growth processes of bacteria
    - b. To enable students to understand the phases of the growth curve of a bacterial population
    - c. To enable students to apply knowledge of reproduction and growth to growing bacteria in the lab
2. Unit Content
    - a. Reproduction and growth
        - 1) Binary fission
        - 2) Growth rate
        - 3) Growth curve
        - 4) Quantitative measurement of bacterial growth

VII. ENZYMES

Units of Instruction

1. Unit Objectives
    - a. To develop within students an awareness of the importance of enzymes
    - b. To enable students to understand how enzymes function
    - c. To enable students to apply knowledge of enzymes to bacterial growth and control
2. Unit Content
    - a. Enzymes

        - 1) Definition
        - 2) Types of enzymes
        - 3) Enzyme structure
        - 4) Enzyme nomenclature
        - 5) Enzyme reactions
        - 6) Conditions affecting enzyme activity
        - 7) Enzyme inhibition

I. BACTERIAL METABOLISM

Units of Instruction

- 1. Unit Objectives
    - a. To make students aware of the importance of metabolism to bacteria
    - b. To impart knowledge of the metabolic processes to students
    - c. To enable students to apply knowledge of the metabolic processes to growth of bacterial cultures
- 2. Unit Content
    - a. Bacterial Metabolism
        - 1) Energy relationships
            - a) Exergonic
            - b) Endergonic
        - 2) Sources of Energy
            - a) Radiant energy
            - b) Chemical energy
        - 3) Biological reactions
            - a) Anabolism (assimilation)
            - b) Catabolism (dissimilation)

- 4) Energy
  - a) ATP
- 5) Fermentation and respiration
  - a) Glycolysis and fermentation
  - b) Glycolysis and the Kreb's cycle

IX. BACTERIAL GENETICS

Units of Instruction

1. Unit Objectives
   - a. To make students aware of concepts in bacterial genetics
   - b. To enable students to understand how various genetic changes take place
   - c. To enable students to apply knowledge of genetics to reactions obtained in lab
2. Unit Content
   - a. Bacterial genetics
     - 1) Variability and inheritance of characteristics
       - a) Genotype
       - b) Phenotype
     - 2) Genotypic changes
       - a) Mutation
       - b) Conjugation
       - c) Transformation
       - d) Transduction
     - 3) Phenotypic changes
       - a) Modifications

X. ORDERS OF BACTERIA

Units of Instruction

1. Unit Objectives
   - a. To make students aware of the 10 orders of bacteria
   - b. To impart to students knowledge of the characteristics found in each order
   - c. To enable students to apply knowledge of the orders of bacteria to identification of an unknown bacterium
2. Unit Content
   - a. Orders of bacteria
     - 1) Pseudomonadales
     - 2) Chlamydobacteriales
     - 3) Hyphomicorobiales
     - 4) Eubacteriales
     - 5) Caryophanales
     - 6) Actinomycetales
     - 7) Beggiatoales
     - 8) Myzobacterales
     - 9) Spirochaetales
     - 10) Mycoplasmatales

XI. THE FUNGI - MOLDS

Units of Instruction

1. Unit Objectives
   - a. To make students aware of the importance of the fungi in general and specifically the molds

- b. To enable students to understand how molds function
- c. To enable students to grow and classify molds in the laboratory

2. Unit Content
    - a. Classification of fungi
        - 1) Phycomycetes
        - 2) Ascomycetes
        - 3) Basidiomycetes
        - 4) Deuteromycetes
    - b. Morphology of molds
    - c. Some molds of microbial interest
        - 1) Mucor
        - 2) Rhizopus
        - 3) Aspergillus
        - 4) Penicillium
    - d. Diseases produced by fungi
        - 1) Plant diseases
        - 2) Animal diseases

XII. YEASTS

Units of Instruction

1. Unit Objectives
    - a. To make students aware of the importance of yeasts
    - b. To enable students to understand anatomy, physiology and life cycles of yeast
    - c. To enable students to apply knowledge of yeasts to laboratory exercises

2. Unit Content
    - a. Types of yeast
        - 1) Industrial yeasts
        - 2) Wild yeasts
        - 3) False yeasts
    - b. Morphology of yeasts
    - c. Reproduction of yeasts
        - 1) asexual
        - 2) sexual
    - d. Economic importance of yeasts
    - e. Pathogenic yeasts

XIII. RICKETTSIAE AND ALGAE

Units of Instruction

1. Unit Objectives
    - a. To make students aware of the importance of rickettsiae and algae
    - b. To impart knowledge of the life cycles and metabolism of rickettsiae and algae to students
    - c. To enable students to apply knowledge of the Rickettsiae and algae to human well-being and endeavor

2. Unit Content
    - a. Rickettsiae
        - 1) History
        - 2) Life Cycles
            - a) Epidemic typhus

        - b) Endemic Typhus
        - c) Other pathogenic Ricke tsiae
    - b. Algae
        - 1) Origin and evolution
        - 2) Characteristics
        - 3) Economic importance

XIV. PROTOZOA

Units of Instruction

- 1. Unit Objectives
    - a. To make students aware of the importance of protozoans
    - b. To enable students to understand how protozoans function and exist
    - c. To enable students to apply knowledge of protozoans to classification and prevention of disease
- 2. Unit Content
    - a. Classification of Protozoa
        - 1) Sarcodina
        - 2) Mastigophora
        - 3) Ciliata
        - 4) Sporozoa
    - b. Disease causing protozoans

XV. VIRUSES

Units of Instruction

- 1. Unit Objectives
    - a. To make students aware of the importance of viruses

b. To enable student to understand the principles of viral existence

c. To enable students to apply knowledge gained to the control of viruses

2. Unit Content

a. Morphology of viruses

b. Types of virus

1) Plant viruses

2) Animal viruses

3) Bacterial viruses (phages)

c. Viral attack of a cell

1) Latent virus

2) Infectious virus

d. Virus diseases and their control

e. Cultivation of viruses

1) Chick embryo

2) Plasma clots

3) Tissue cultures

XVI CONTROL OF MICROORGANISMS

Units of Instruction

1. Unit Objectives

a. To make students aware of the methods of control of microorganisms

b. To enable students to understand how microorganisms are controlled by the various chemical and physical means.

c. To enable students to apply chemical and physical agents in the control of microorganisms

2. Unit Content

- a. Introduction to control of microorganisms
  - 1) Types of microbial control
    - a) Physical control
    - b) Chemical control
  - 2) Terminology
    - a) Sterilization
    - b) Disinfectant
    - c) Antiseptic
    - d) Sanitizer
    - e) Bactericide
    - f) Viricide
    - g) Fungicide
    - h) Bacteriostatic
    - i) Fungistatic
  - 3) Conditions influencing antimicrobial action
  - 4) Mode of action of Antimicrobial agents
- b. Control by physical means (1 lecture)
  - 1) Temperature
    - a) Thermal Death Point
    - b) Thermal Death Time
    - c) Moist Heat
  - 2) Desiccation
    - a) Osmosis and Osmotic Pressure
  - 3) Radiations
    - a) Natural
    - b) Man made

        4) Sonic and Ultrasonic Waves
        5) Electricity
    c. Control by chemical means (2 lectures)
        1) Characteristics of the ideal disinfectant
        2) Major groups of chemical antimicrobial agents
            a) Phenol and Phenolic compounds
            b) Alcohols
            c) Iodine
            d) Chlorine and chlorine compounds
            e) Heavy metals and their compounds
            f) Dyes
            g) Soaps and synthetic detergents
            h) Quaternary ammonium compounds
            i) Hydrogen peroxide
            j) Acids and alkalies
            k) Disinfectant aerosols

XVII. ANTIBIOTICS AND CHEMOTHERAPEUTIC AGENTS

Units of Instruction

1. Unit Objectives
    a. To make students aware of the antibiotics and chemotherapeutic agents which control microorganisms
    b. To impart to students how antibiotics and chemotherapeutic agents control microorganisms
    c. To enable students to control microbial populations through the use of antibiotics and chemotherapeutic agents

2. Unit Content
    - a. Introduction to antibiotics and chemotherapeutic agents
        - 1) Antibiotic
        - 2) Chemotherapeutic agent
    - b. Antibiotics
        - 1) Characteristics of an ideal antibiotic
        - 2) Mode of action
        - 3) Usage
    - c. Chemotherapeutic agents
        - 1) Characteristics of an ideal chemotherapeutic agent
        - 2) Mode of action
        - 3) Usage

XVIII. PATHOGENS, VIRULENCE AND INFECTION

Units of Instruction

1. Unit Objectives
    - a. To make students aware of the importance of pathogens, virulence and infection
    - b. To impart to students how the virulence of a pathogen governs infection
    - c. To enable students to apply knowledge of pathogens, virulence and infections to various diseases

2. Unit Content
    - a. Pathogens, virulence and infection
        - 1) Theories of the cause of disease
            - a) Superstitions

        b) Humoral concept
        c) Germ theory
      2) Pathogenicity and virulence
        a) Pathogen
        b) Virulence
          (1) Factors influencing virulence
      3) Infection
        a) Factors influencing infection
      4) Communicability

XIX. RESISTANCE AND IMMUNITY

Units of Instruction

1. Unit Objectives
   a. To make students aware of the importance of resistance and immunity
   b. To enable students to understand how resistance and immunity are obtained
   c. To enable students to apply knowledge of resistance and immunity to curbing disease
2. Unit Content
   a. Resistance and immunity
      1) Body defense
         a) Skin and mucous membranes
         b) Phagocytes
         c) Antibodies
      2) Natural resistance
         a) Species resistance
         b) Racial resistance
         c) Individual resistance

3) Acquired resistance (immunity)

a) Active immunity

b) Passive immunity

XX. SELECTED AREAS OF APPLICATION OF MICROBIOLOGY

Units of Instruction

1. Unit Objectives

a. To make students aware of the various areas of application of microbiology

b. To enable students to understand how microbioloby is applied to each of the following areas

c. To enable students to apply knowledge of microbiology to every day life

2. Unit Content

a. Microbiology of water

1) Microbial flora of natural waters

a) Atmospheric water

b) Surface water

c) Ground water

2) Water sampling

b. Microbiology of sewage (1 lecture)

1) Characteristics of sewage

2) Sewage treatment and disposal

3) The pollution problem

c. Microbiology of milk

1) Sources of microorganisms in milk

2) Types of microorganisms in milk

3) Microbiological examination of milk

        4) Pasteurization
        5) Grades of milk
    d. Microbiology of foods (1 lecture)
        1) Preservation of food
        2) Microbial spoilage of foods
        3) Fermented foods
    e. Microbiology of the soil (1 lecture)
        1) Microbial flora of the soil
        2) Biochemical activity of microorganisms in the soil
    f. Plant pathology
        1) Importance of plant diseases
        2) Causative agents of plant infections
            a) Bacterial plant pathogens
            b) Viral plant infections
            c) Fungus diseases of plants
            d) Nematodes which attack plants
    g. Serology (2 lectures)
        1) Serological tests used in the diagnosis of disease
    h. Animal diseases (3 lectures)
        1) Staphlococcal and streptococcal
        2) The Pneumonia group
        3) Other diseases including venereal diseases

LABORATORY EXERCISES

EXERCISE #I

1. The Microscope
2. Preparing, Fixing and Staining Slides of *Escherichia coli* and *Sarcina lutea*

EXERCISE #II

1. The Effect of Buffers and Energy Source on Growth
2. Streak Plate Methodology

EXERCISE #III

1. Gram Staining Techniques
2. Endospore Staining Techniques

EXERCISE #IV

1. Acid Production In Microorganisms From Carbohydrates

EXERCISE #V

1. Demonstrating of Starch Hydrolysis
2. Demonstrating of Casein Hydrolysis

EXERCISE #VI

1. Morphology of Molds
2. Morphology of Yeasts

EXERCISE #VII

1. Bacteriophage Isolation and Characteristics

EXERCISE #VIII

1. Identification of Protozoans
2. Identification of Helminths

EXERCISE #IX

1. Physical Control of Microorganisms
2. Chemical Control of Microorganisms

EXERCISE #X

1. Antibiotic Control of Microorganisms
2. Phagocytosis of Antigens

EXERCISE #XI

1. Analysis of Water For Coliforms
2. Human Blood Types

TEXT AND REFERENCES

Breed, Murray and Smith. Bergey's Manual of Determinative Bacteriology.

Brock. Milestones In Microbiology.

Frobisher. Fundamentals of Microbiology.

Hahon. Selected Papers In Virology.

Jacobs. Dictionary of Microbiology.

Pelezar and Reed. Microbiology.

Stanier. The Microbial World.

Umbreit. Modern Microbiology.

Weiser. Practical Food Microbiology and Technology.

Zinsser. Microbiology.

INSTRUCTIONAL MEDIA

American Society For Microbiology, 115 Huron View Boulevard, Ann Arbor, Michigan.

Grams Stain: A Demonstration of Technic, 16 mm., 11 min., sound, color.

Demonstrates the procedure involved in preparing a Gram's stain. Gram positive and gram negative reactions are shown photomicroscopically.

Bausch and Lomb Optical Company, Rochester, 2, New York

The Compound Microscope. 16 mm., 22 min., sound, color.

Provides a review of the different varieties of microscopes. Demonstrates the construction, operation and care of a modern microscope.

Coronet Instructional Films, 65 East South Water Street, Chicago Illinois

Microorganisms That Cause Disease. 16 mm., 11 min., sound, color.

Presents five different classifications of pathogenic microorganisms including fungi, bacteria, viruses, rickettsiae and protozoa. This film stresses the concept that pathogenic microorganisms cause infectious diseases through destruction of cells.

Encyclopaedia Britannica Educational Corporation. 1822 Pickwick Avenue, Glenview, Illinois 60025.

Bacteria. 16 mm., 19 min., sound, color.

This film demonstrates the basic characteristics of bacteria including structure, manner of feeding and the process of reproduction

Body Defenses Against Disease. 16 mm., 11 min., sound, black and white.

Examines the three lines of defense against infection - the skin, mucous membranes and circulatory system including liver and spleen.

Immunization. 16 mm., 11 min., sound, black and white.
Explains what immunization is and how immunity to infectious diseases is attained. Discusses active and passive immunity to disease.

McGraw-Hill Book Company, Text Film Division, 327 West 41st Street, New York, New York 10036.

The Germ Theory Of Disease. 16 mm., 28 min., sound, color.
Outlines the history of contagion in diseases. Explains host-parasite relationship and discusses Koch's Postulates. Explains symptomology of disease causing organisms.

Fungi. 16 mm., 30 min., sound, color.
The nature and importance of fungi are considered. The saprophytic, parasitic and symbiotic characteristics of various types of fungi are described and discussed.

INTRODUCTORY CHEMISTRY I (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 2; Laboratory, 3.

DESCRIPTION

This course is designed to provide the student with a basic knowledge of the language of chemistry, its symbols and fundamental mathematical relationships. It is also intended to develop ability and skills which are needed to probe the various fundamental phases of chemistry thereby establishing the correlation of this discipline to various areas of biological and agriculturally oriented technology. An introduction to the empirical basis of chemistry is gained through the completion of a series of laboratory exercises that emphasizes familiarization and usage of equipment and instrumentation which is important to the animal science oriented student.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Units of Measure, Characteristic Properties of Matter and Energy	2	Laboratories not
II.	Atomic and Molecular Structure Periodicity of the Elements	3	correlated to lectures.
III.	States of Matter	3	Laboratory
IV.	Stoichiometry	4	exercises
V.	Solutions	3	enumerated

		Class Hours	Laboratory Periods
VI.	Colloidal System	1	following
VII.	Metallic Elements	2	lecture
VIII.	Non Metallic Elements	1	outline.
IX.	Carbon Compounds	3	
	Totals	22	11

I. UNITS OF MEASURE, CHARACTERISTIC PROPERTIES OF MATTER AND ENERGY

Units of Instruction

1. Unit Objectives
    a. To teach the student units of measure that will be used in the study of the properties of matter and energy. To show how the units and properties being measured are related.
2. Unit Content
    a. The metric system - its units and use. Temperature scales and their comparison. Physical and chemical properties will be defined and compared. Heat energy will be discussed specifically with respect to heat content and temperature.

II. ATOMIC AND MOLECULAR STRUCTURE, PERIODICITY OF THE ELEMENTS

Units of Instruction

1. Unit Objectives
    a. To familiarize the student with the parts and relationships of the atom. To teach the student the various ways in which atoms combine

to form compounds.

2. Unit Content

   a. Fundamental particles, the nucleus, the electron shells or energy levels using the Bohr model and the quantum mechanics model. Properties of the atoms based on their electronic structure and the types of compounds formed; ionic, covalent, or polar covalent.

III. STATES OF MATTER

Units of Instruction

1. Unit Objectives

   a. To become aware of the properties of the three states of matter: gas, liquid, and solid; and to become aware of the measurement and use of these properties.

2. Unit Content

   a. Solids, liquids, gases; their description on the basis of empirical knowledge and the kenetic molecular theory: to teach the relationship of pressure, temperature, and volume changes in the states of matter with emphasis in the gaseous state.

IV. STOICHIOMETRY

Units of Instruction

1. Unit Objective

   a. To increase the proficiency of the student in writing chemical reaction equations and in making chemical calculations.

2. Unit Content

a. Formulas, equations, mole concept, weight relationships, and introduction to oxidation reduction reactions.

V. SOLUTIONS

Units of Instruction

1. Unit Objective

a. To teach the student the preparation and properties of solutions as they relate to the chemistry laboratory.

2. Unit Content

a. Types of solutions of the various states of matters. Different methods of expressing concentration, reactions in solutions, colligative properties of solutions.

VI. COLLOIDAL SYSTEM

Units of Instruction

1. Unit Objective

a. Comparison of colloidal systems to solutions and suspentions.

2. Unit Content

a. Particle size difference between colloids and solutions. Factors which stabolize colloidal systems.

VII. METALLIC ELEMENTS

Units of Instruction

1. Unit Objective

a. To become familiar with the properties of the metallic elements and their compounds

2. Unit Content

   a. Alkali metals, alkaline earth metals, transition metals.

VIII. NON-METALLIC ELEMENTS

Units of Instruction

1. Unit Objective

   a. To become familiar with the properties of non-metallic elements and their compounds.

2. Unit Content

   a. Halogens, groups IV and V, carbon and other selected elements.

IX. CARBON COMPOUNDS

Units of Instruction

1. Unit Objective

   a. To familiarize the student with the major types of organic and bio-chemical compounds and their relation to the parent hydrocarbon. Structure, isomerism. Importance of various biochemical compounds for the living organism.

2. Unit Content

   a. Nomenclature, reactions and properties of various hydrocarbons, oxygen compounds, nitrogen compounds and selected biologically active compounds.

LABORATORY EXERCISES

EXERCISE #I BEGINNING LABORATORY SKILLS AND SERVICES

1. Burners
2. Glass working
3. Filtration
4. Handling liquids
5. Keeping samples dry
6. Controlling fumes

EXERCISE #II METHODS OF MEASUREMENT

1. Volume
2. Weight
3. Density
4. Temperature

EXERCISE #III IDENTIFICATION OF A SUBSTANCE

1. Solubility
2. Density
    a. Solid
    b. Liquid
3. Melting point
4. Boiling point
5. Identification of an unknown substance

EXERCISE #IV SEPARATION OF COMPONENTS OF MIXTURES

1. Filtration
2. Extraction
3. Distillation
4. Sublimation
5. Separation and recovery of components of simple mixtures

EXERCISE #V DETERMINATION OF A CHEMICAL FORMULA

EXERCISE #VI PHYSICAL AND CHEMICAL CHANGES

1. Examples of physical and chemical changes
2. Identification of iodine and antimony
3. Interaction of iodine and antimony

EXERCISE #VII SOLUTIONS AND SOLUBILITY

1. Gases in liquids
2. Liquids in liquid
3. Solids in liquids

EXERCISE #VIII DETERMINATION OF R, THE GAS CONSTANT

EXERCISE #IX RELATIVE CHEMICAL ACTIVITIES OF THE METALS

1. Displacement of hydrogen from cold water
2. Displacement of hydrogen from hot water
3. Displacement of hydrogen from steam
4. Displacement of hydrogen from acids
5. Displacement of metals from aqueous solutions of their salts.

EXERCISE #X ATOMIC WEIGHT FROM SPECIFIC HEAT

EXERCISE #XI DETERMINATION OF HYDROGEN ION CONCENTRATION

1. The strengths of acids and bases
2. Buffer action

TEXT

Wood, et. al. Fundamentals of College Chemistry

Hered and Nebergall. Laboratory Manual: Basic Laboratory Studies In College Chemistry.

REFERENCES

King and Caldwell. General Chemistry.

Ouellette, R. J. Introductory Chemistry.

Selwood. Chemical Principles.

Selwood. General Chemistry.

INSTRUCTIONAL MEDIA

Atomic Energy Commission, Division of Public Information,
376 Hudson Street, New York 14, New York

Understanding The Atom (12 part series). 16 mm., sound, black and white.

Indiana University, Bloomington, Indiana (NET)

The Chemical Elements. 16 mm., 35 min., sound, black and white.

Modern Learning Aids, New York, New York

Gasses And How They Combine. 16 mm., 22 min., sound, color.

State University of Iowa, Iowa City, Iowa

Atomic Models, Valence And The Periodic Table. 16 mm., 44 min., sound, color.

ANIMAL SCIENCE TECHNOLOGY CURRICULUM

SECOND TERM COURSE SCHEDULE

Mammalian Anatomy and Histology 59

Zoonoses 76

English Composition I 99

Introductory Sociology 105

Physical Education II (New York State Graduation Requirement)

MAMMALIAN ANATOMY AND HISTOLOGY

HOURS REQUIRED

Class, 3; Laboratory, 3; Recitation 1.

DESCRIPTION

A study of the comparative gross and microscopic anatomy of the various domestic animals and laboratory animals involved in veterinary activities. The gross anatomy is taught primarily through dissection of preserved canine specimens with correlation of structures observed on the preserved specimen and live animal palpation and observation. The microscopic anatomy of the tissues of the body are studied concurrently with the gross anatomy by the use of preserved histological sections on microscopic slides as well as 35mm color slides.

Class hours are divided into two lectures weekly on gross anatomy and one hour weekly on microscopic anatomy. The lecture material is coordinated so that the systems are covered grossly as well as microscopically within the same period of time.

Dissection laboratories will involve student dissection of preserved canine specimens under the direct supervision of a veterinarian. The students work in teams of two and compare their work with other teams of students. Practical examinations are given to test the proficiency of the students in anatomical knowledge. Equipment consists of dissecting tables, skeletal models of various species, charts and diagrams, reference texts and 2 x 2 color slides.

Histology recitation consists of a one hour weekly discussion of tissue anatomy utilizing overhead projections and 2 x 2 color slides of photomicrographs that are shown while each student studies a prepared histological slide of that tissue under the microscope. In this way, the instructor can discuss the particular tissue while the student observes the tissue under the microscope.

The number of students in each laboratory section is limited to 24 due to spatial seating arrangements and available instructors.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. Gross Anatomy		
A. Introduction	3	1
B. Skeletal System	2	1
C. Muscular System	2	3
D. Nervous System	2	1
E. Cardio-Vascular System	2	2
F. Respiratory System	1	½
G. Uro-Genital System	3	½
H. Endocrine System	2	½
I. Digestive System	2	½
J. Special Senses (Eye and Ear)	2	1
Total	21	11

II. Microscopic Anatomy

A. Epithelial Tissue	3	2
B. Muscle Tissue	1	1
C. Connective Tissue	3	2
D. Blood and Lymph	1	2
E. Endocrine Glands	2	1
F. Nervous Tissue	1	1
G. Digestive Tissue	1	2
Total	12	11

I. GROSS ANATOMY

A. Introduction

Units of Instruction

1. Definition of Anatomical Terms
2. Systematic Anatomy
3. Anesthesiology
4. Topographic Anatomy
5. Descriptive terms for Dissection
6. Cell Structure
7. Cell Types and Specialization
8. Tissues and Systems of Animal Body

B. Skeletal System

Units of Instruction

1. Classification of Bones
2. Axial Skeleton
3. Skull
4. Vertebral Column
5. Pectoral Limb
6. Pelvic Limb

Laboratory Projects

1. Identify and observe structure of
    - a) Vertebral column
    - b) Skull
    - c) Ribs
    - d) Sternum
    - e) Pectoral limb (scapula, humerus, radius, ulna, carpals, metacarpals, phalanges)
    - f) Pelvic limb (pelvis, femur, tibia, fibula, tarsals, metatarsals, phalanges)

C. Muscular System

Units of Instruction

1. Muscle attachments
2. Functional grouping of uscles
3. Synovial structures
4. Muscles acting on shoulder joint
5. Muscles acting onthe elbow
6. Muscles acting on the carpus
7. Muscles acting onthe hip joint
8. Muscles acting on the stifle
9. Muscles acting on the hock
10. Muscles of the head and neck
11. Abdominal muscles
12. Respiratory muscles

Laboratory Projects

1. Identify and observe structure of:
    - a) Muscles of head and neck
    - b) Muscles of shoulder girdle
    - c) Muscles of shoulder joint

- d) Muscles of front leg
- e) Muscles of hip area
- f) Muscles of thigh area
- g) Muscles of lower rear leg
- h) Muscles of abdominal area
- i) Action of all muscles observed

D. Nervous System

Units of Instruction

1. Central nervous system
    - a) Brain
    - b) Spinal cord
2. Peripheral nervous system
    - a) Cranial and spinal nerves
    - b) Autonomic nervous system
        - 1) Parasympathetic nervous system
        - 2) Sympathetic nervous system
    - c) Ganglia
    - d) Plexus
3. Meninges

Laboratory Projects

1. Removal of brain and identification of:
    - a) Cerebrum
    - b) Cerebellum
    - c) Medulla oblongata
    - d) Dura mater
    - e) Pituitary gland
    - f) Cranial nerves

2. Dissection of spinal cord and nerves
3. Nerves of brachial plexus and lumbo-sacral plexus dissected and identified.

E. Cardio-vascular system

Units of Instruction

1. Functions of blood
2. Pericardium
3. Anatomy of the heart
    a) Chambers
    b) Valves
    c) Blood flow pattern
4. Vessels
    a) Arteries
    b) Veins
    c) Capillaries
    d) Lymphatics
    e) Vessels of clinical importance

Laboratory Projects

1. Locate and identify the pericardium, heart chambers and valves, and major arteries and veins in preserved dissection specimen

F. Respiratory system

Units of Instruction

1. Functions of respiratory tract
2. Components of respiratory tract
3. Nostrils and nasal cavity
4. Sinuses
5. Pharynx
6. Larynx

7. Trachea and lungs

Laboratory Projects

1. Locate and identify the pleura, lungs with various lobes, trachea, larynx, pharynx, nasal cavity, sinuses, thymus gland and other structures of thoracic cavity.

G. Uro-genital system

Units of Instruction

1. Kidney anatomy
2. Kidney microanatomy
3. Bladder
4. Urethra
5. Male reproductive tract
    a) Testicles
    b) Spermatogenesis
    c) Vas deferens
    d) Scrotum
    e) Testicular descent
    f) Castration effects
    g) Accessory sex glands
    h) Penis
6. Female reproductive tract
    a) Ovaries
    b) Fallopian tubes
    c) Uterus
    d) Cervix
    e) Vagina
    f) Vulva
    g) Major vessels of female reproductive tract

Laboratory Projects

1. Locate and identify structures of urinary tract, male reproductive tract and the female reproductive tract.

II. Endocrine System

Units of Instruction

1. Introduction to components
2. Hormones
3. Pituitary gland
4. Adrenal gland
5. Thyroid gland
6. Parathyroid gland
7. Pancreas endocrine portions
8. Pineal gland
9. Thymus gland
10. Gonads

Laboratory Projects

1. Locate and identify the various endocrine glands of the body in the preserved dissection specimen.

I. Digestive system

Units of Instruction

1. Processes of digestion
2. Various animal diets
3. Typical digestive structure
4. Mouth, tongue and pharynx
5. Esophagus and stomach
6. Small intestine
7. Large intestine

8. Rectum and anus

9. Accessory digestive glands

    a) Salivary glands

    b) Liver

    c) Pancreas

Laboratory Projects

1. Locate and identify the various digestive organs and glands in both preserved specimens and in fresh necropsy specimens if available.

J. Special senses (eye and ear)

Units of Instruction

1. Eye

    a) External orbit and ocular muscles

    b) Cornea and sclera

    c) Choroid, iris and ciliary body

    d) Retina and optic nerve

2. Ear

    a) External ear

    b) Middle ear

    c) Inner ear and auditory Nerve

Laboratory Projects

1. Dissect canine eye and identify all structures discussed in lecture.

2. Dissect canine ear and identify all structures discussed in lecture

II. MICROSCOPIC ANATOMY

A. Epithelial Tissue

Units of Instruction

1. Simple squamous epithelium
2. Stratified squamous epithelium
3. Cutaneous stratified epithelium
4. Cuboidal epithelium
5. Simple columnar epithelium
6. Pseudostratified columnar epithelium
7. Ciliated columnar epithelium
8. Transitional epithelium

Laboratory Projects (Recitation)

1. Observe color slides of various types of epithelial cells in tissues.
2. Study prepared histological slides of epithelial cells and tissue sections under microscope.

B. Muscle tissue

Units of Instruction

1. Introduction to muscle tissues
2. Smooth or involuntary muscle
3. Skeletal or voluntary muscle
4. Cardiac muscle

Laboratory Projects (Recitation)

1. Observe color slides of muscle tissue types and learn functions and locations of various types

2. Study preserved histological slides of muscle tissues

C. Connective tissue

Units of Instruction

1. Cell types of connective tissue
    a) Mesenchymal cells
    b) Fibroblastic cells
    c) Macrophage cells
    d) Fat cells
    e) Leukocytes (white blood cells)
    f) Plasma cells
    g) Mast cells
    h) Chromatophores (pigment cells)
2. Connective tissue fibers
    a) Collagenous fibers
    b) Elastic fibers
    c) Reticular fibers
3. Amorphous substances
4. Areolar connective tissue
5. Adipose tissue
6. Tendons and sponeuroses
7. Ligaments
8. Cartilage
    a) Hyaline cartilage
    b) Elastic cartilage
    c) Fibrocartilage
9. Bone
    a) Classification of bones
    b) Bone cells (osteocytes)

        - c) Interstitial substance
        - d) Compact bone structure
        - e) Cancellous bone structure
        - f) Periosteum
        - g) Endosteum
        - h) Bone marrow
        - i) Typical long bone structure

Laboratory Projects (Recitation)

1. Observe color slides of various types of connective tissue
2. Study histological slides of connective tissue sections and learn differences with relation to function
3. Observe gross anatomy of bones by comparative anatomical study of mounted skeletons and live animals

D. Blood and lymph

Units of Instruction

1. Functions of blood
2. Blood plasma
3. Erythrocytes
4. Leukocytes
5. Thrombocytes
6. Clotting factors
7. Lymph and lymph flow

Laboratory Projects (Recitation)

1. Observe color slides of blood smears and various cell types

2. Study various species blood smears and identify cellular components of each, noting any species variation among cells

E. Endocrine glands

Units of Instruction

1. Hormones in relation to body function
2. Pituitary gland
    a) Anterior lobe
    b) Posterior lobe
3. Adrenal gland
    a) Adrenal cortex
    b) Adrenal medulla
4. Thyroid gland
5. Parathyroid gland
6. Gonads

Laboratory Projects (Recitation)

1. Observe color slides of various endocrine glands and note histological components
2. Study prepared histological sections of endocrine glands and correlate function of each with anatomical structure

F. Nervous System

Units of Instruction

1. Neuron concept
2. Synapse
3. Cell body
4. Ganglia
5. Cell processes

            - a) Dendrons
            - b) Axon
        6. Classification of nerve fibers
            - a) Myelinated nerve fibers
            - b) Unmyelinated nerve fibers
        7. Neuroglia
            - a) Astrocyte cells
            - b) Oligodendroglia cells
            - c) Microglia cells
        8. Degeneration and regeneration of peripheral nerves
        9. Meninges

Laboratory Projects (Recitation)

1. Observe color slides of neurons and other nervous tissue components
2. Study histological slides of brain, spinal cord and peripheral nerve tissue and identify various cell types seen

G. Digestive Tissues

Units of Instruction

1. Structural plan of hollow organs
    - a) Tunica mucosa
    - b) Tunica submucosa
    - c) Tunica muscularis
    - d) Tunica adventitia or scrosa
2. Esophagus
3. Stomach
4. Intestine, small and large
5. Rectum

6. Major salivary glands
7. Pancreas
8. Liver
   a) Structural plan
   b) Lobulation
   c) Vessels
   d) Gall bladder and bile duct

Laboratory Projects (Recitation)

1. Observe color slides of various digestive organs
2. Study histological sections of digestive organs and note differences between various areas of digestive tube
3. Compare histological sections of liver with three-dimensional drawings by Frank Nettler, M.D.

TEXT

Frandson, R. D. Anatomy and Physiology of Farm Animals.

Miller, M. E. Guide to the Dissection of the Dog.

REFERENCES

Baer, J. C. Comparative Anatomy of Vertebrates.

Booth, E. S. Laboratory Anatomy of the Cat.

Chiasson, R. B. Laboratory Anatomy of the White Rat.

Crouch, J. E. Functional Human Anatomy.

Getty, R. Atlas for Applied Veterinary Anatomy.

Harrison, B. M. Dissection of the Cat.

McLeod, W. M. Bovine Anatomy.

Miller, M. E. and B. J. Christensen Anatomy of the Dog.

Ranson, S. W. The Anatomy ofthe Nervous System.

Taylor, J. A. Regional and Applied Anatomy of the Domestic Animals, Part I - Head and Neck, Part II - Thoracic Limb, Part III - Pelvic Limb, Part IV - Thorax and Abdomen.

Wischnitzer, S. Atlas and Dissection Guide for Comparative Anatomy.

INSTRUCTIONAL MEDIA

American Medical Association Library, Chicago, Illinois

Exploring the Human Nervous System. 16 mm., 23 min., sound, color.

Anatomy of nervous system and research associated with the nervous system.

Coronet Instructional Films, Chicago, Illinois

Human Body: Digestive System. 16 mm., 14 min., sound black and white.

Defines function of digestion in terms of nutrient breakdown of carbohydrates, fats and proteins into simple food materials. Shows live action, animation and fluroscopic shots of processes and anatomical structures.

Human Body: Muscular System. 16 mm., 13 1/2 min., sound, black and white.

Shows types of muscle in body using photomicrographs models and animation.

Human Body: Nervous System. 16 mm., 13 1/2 min., sound, black and white.

Shows main organs of nervous system in gross and histological detail. Discusses control of body processes by central nervous system.

Human Body: Respiratory System. 16 mm., 13 1/2 min., sound, black and white.

Describes organs of respiratory system and describes ventilation and physics of alveolar diffusion.

ZOONOSES

HOURS REQUIRED

Class, 3; Laboratory, none.

DESCRIPTION

A fundamental study of those infectious diseases of animals which may be transmitted to man or vise versa. The epidemiological characteristics, causative agent, symptoms, pathogenicity and recommended control for each disease is covered. Public health implications are presented on the zoonoses affecting laboratory animals as well as domestic large and small animals.

In addition to acquiring knowledge for self-protection, it is intended for the beginning student to become better acquainted with some of the many pathogens which plague man and animals. Likewise, during the course, the student should begin to acquire an appreciation for the importance of good colony and herd management, proper sanitation practices and the latest methods of disease control and prevention.

A basic vocabulary is first established through a presentation of pertinent zoonotic and infectious disease terms. On this, the course builds by consideration of how and why infectious agents produce a disease in the animal body. Following this introduction, a comprehensive study is made of selected zoonotic diseases which fall into four major groupings; namely, 1) Virus Diseases, 2) Rickettsial diseases, 3) Fungus Diseases and 4) Bacterial Diseases. Students are encouraged and urged to pursue the study of other zoonoses which are beyond the scope and time allotted to this course.

To increase course interest and relevancy, current newspaper and magazine articles on zoonoses are presented as well as the showing of applicable motion picture films when these are available.

MAJOR DIVISIONS

	Class Hours	Laboratory periods
I. Infectious and Communicable Disease Terminology	5	None
II. Infectious Agents and Their Relation to Establishment ofDisease	2	
III. Study of Individual Zoonotic Diseases		
A. Virus Diseases	10	
B. Rickettsial Diseases	3	
C. Fungus Diseases	3	
D. Bacterial Diseases	10	
Total	33	0

I. INFECTIOUS AND COMMUNICABLE DISEASE TERMINOLOGY

Units of Instruction

1. Introduction

a. Definition of Zoonoses

    - b. Three groupings of communicable diseases according to their pathogenicity
  2. Alphabetical listing of infectious and zoonotic disease terms (from Aerobes to Zoonosis) to be defined and discussed during class periods.

II. INFECTIOUS AGENTS AND THEIR RELATION TO ESTABLISHMENT OF DISEASE

Units of Instruction

1. Definition of infection
2. How Pathogenic Agents produce injury
3. Special characteristics which aid microorganisms in producing disease (characteristics of infectiousness)
4. Factors contributing to "contagiousness" of an infectious agent
5. Channels by which infectious agents gain entrance to the body
6. Body defenses against infectious agents
    - a. Primary
    - b. Secondary
7. Factors of disease incubation
8. Classification of infectious agents according to specific pathology produced
9. Virus "inclusion bodies"
10. Time classification of infectious diseases
11. Termination of infectious diseases

III STUDY OF INDIVIDUAL ZOONOTIC DISEASES

Units of Instruction

A. Virus Diseases

1. Cat scratch fever
    a. Identification
    b. Occurrence
    c. Mode of transmission
    d. Incubation period
    e. Prevention and control
2. Measles
    a. Identification
    b. Occurrence
    c. Reservoir
    d. Mode of transmission
    e. Incubation and period of communicability
    f. Control
3. German measles
    a. Identification
    b. Incubation and period of communicability
    c. Control and prevention
4. Mumps
    a. Identification
    b. Occurrence
    c. Reservoir
    d. Transmission
    e. Incubation and period of communicability
    f. Control

5. Cow pox
    a. Historical interest
    b. Identification
    c. Prevention
6. Horse pox
    a. Etiology
    b. Two forms
7. Sheep pox
8. Swine pox
9. Fowl pox
10. Pox virus of old world monkeys
11. Influenza
    a. Historical and zoonotic relationships
    b. Identification
    c. Occurrence
    d. Reservoir
    e. Transmission
    f. Incubation and communicable period
    g. Prevention
12. Encephalomyelitis
    a. Occurrence
        1) Eastern equine encephalitis
            a) Host range
            b) Mortality rates
            c) Transmission - vector
            d) Identification
            e) Incubation
            f) Prevention and control

2) Western equine encephalitis
    a) Mortality rates
    b) Host range
    c) Incubation period
    d) Symptoms
    e) Seasonal prevalence
    f) Vector
    g) Prevention and control
3) Venezuelan equine encephalitis
    a) Identification
    b) Host range
    c) Vector
    d) Prevention and control
4) St. Louis encephalitis
    a) Host range
    b) Reservoir
    c) Vector
    d) Mortality rates
    e) Identification
    f) Control

13. Foot and Mouth Disease
    a. Identification
    b. Host range
    c. Resistance of the organism
    d. Epizootiology
    e. Treatment
    f. Prevention and control

14. Yellow fever
    a. Identification
    b. Fatality rate
    c. Incubation period
    d. Reservoir
    e. Susceptibility and resistance
    f. Transmission vector
    g. Prevention and control
15. Rabies
    a. Identification
    b. Occurrence
    c. Reservoir
    d. Transmission
    e. Prevention and control
16. Lymphocytic choriomeningitis (LCM)
    a. Identification
    b. Occurrence
    c. Reservoir
    d. Incubation period
    e. Prevention and control
17. Equine infectious anemia (Swamp Fever)
    a. Identification
    b. Occurrence
    c. Incubation period
    d. Transmission - fomites and vectors
    e. Prevention and control
18. Vesicular stomatitis
    a. Identification

    - b. Occurrence
    - c. Incubation period
    - d. Transmission
    - e. Immunity and prevention of the disease

19. Newcastle disease
    - a. Identification
    - b. Occurrence
    - c. Incubation period
    - d. Transmission
    - e. Prevention and control
20. Psittacosis (ornithosis)
    - a. Identification
    - b. Occurrence
    - c. Incubation period
    - d. Reservoir
    - e. Transmission
    - f. Prevention and control
21. B-Virus
    - a. Identification
    - b. Occurrence
    - c. Transmission
    - d. Incubation period
    - e. Prevention and control
22. Simian viruses (unclassified)
23. Infectious Hepatitis
    - a. Identification
    - b. Occurrence
    - c. Incubation period

        d. Transmission
        e. Treatment
        f. Prevention and control

B. Rickettsial diseases
    1. Introduction
    2. Typhus fever
        a. Epidemic
        d. Endemic
            1) Identification
            2) Occurrence
            3) Reservoir of infection
            4) Transmission
            5) Incubation period
            6) Prevention and control
    3. Rocky mountain spotted fever
        a. Identification
        b. Occurrence
        c. Reservoir of infection
        d. Transmission
        e. Incubation period
        f. Prevention and control
    4. Q-Fever
        a. Identification
        b. Occurrence
        c. Incubation period
        d. Prevention and control
    5. Rickettsial pox
        a. Identification

  - b. Occurrence
  - c. Reservoir of infection
  - d. Transmission
  - e. Incubation period
  - f. Prevention and control
- 6. Tsutsugamuski fever
  - a. Historical interest
  - b. Identification
  - c. Occurrence
  - d. Reservoir of infection
  - e. Incubation period
  - f. Prevention and control

C. Fungus diseases

- 1. Introduction
- 2. Aspergillosis
  - a. Identification
  - b. Occurrence
  - c. Reservoir of infection
  - d. Transmission
  - e. Incubation period
  - f. Prevention and control
- 3. Blastomycosis (North American)
  - a. Identification
  - b. Occurrence
  - c. Reservoir
  - d. Transmission
  - e. Incubation period
  - f. Prevention and control

4. Coccidioidomycosis
    a. Identification
    b. Occurrence
    c. Reservoir of infection
    d. Transmission
    e. Incubation period
    f. The disease in man
    g. The disease in animals
    h. Prevention and control
5. Cryptococcosis
    a. Identification
    b. Occurrence
    c. Reservoir of Infection
    d. Transmission
    e. Incubation period
    f. The disease in man
    g. The disease in animals
    h. Prevention and control
6. Histoplasmosis
    a. Identification
    b. Occurrence
    c. Reservoir of infection
    d. Transmission
    e. Incubation
    f. The disease in man
    g. The disease in animals
    h. Prevention and control

7. Nocardiosis
    a. Identification
    b. Occurrence
    c. Transmission
    d. Incubation period
    e. The disease in man
        1) Pulmonary-systemic
        2) Mycetoma
    f. The disease in animals
    g. Prevention and control
8. Ring Worm
    a. Types of ringworm
        1) Tinea capitis
        2) Tinea corporis
        3) Tinea pedis
        4) Tinea unguium
    b. Identification and etiological agent of each species
    c. Occurrence of each ringworm
    d. Reservoir
    e. Transmission
    f. Incubation
    g. Prevention and control of each ringworm species

D. Bacterial Diseases
    1. Actinomycosis
        a. Identification
        b. Occurrence
        c. Reservoir of infection

    - d. Transmission
    - e. Incubation period
    - f. The disease in man
    - g. The disease in animals
    - h. Prevention and control
2. Anthrax
    - a. Identification
    - b. Occurrence
    - c. Reservoir of infection
    - d. Transmission
    - e. Incubation
    - f. Prevention and control
3. Bacillary dysentery
    - a. Identification
    - b. Occurrence
    - c. Reservoir
    - d. Transmission
    - e. Incubation period
    - f. Prevention and control
4. Brucellosis
    - a. Identification
        - 1) Brucella abortis
        - 2) Brucella suis
        - 3) Brucella melitensis
    - b. Occurrence
    - c. Reservoir of infection
    - d. Transmission

  - e. Incubation period
  - f. The disease in humans
  - g. The disease in animals
  - h. Prevention and control
- 5. Erysipeloid
  - a. Identification
  - b. Occurrence
  - c. Incubation period
  - d. Transmission
  - e. Prevention and control
- 6. Glanders
  - a. Identification
  - b. Occurrence
  - c. Reservoir
  - d. Transmission
  - e. Incubation period
  - f. Disease in man
  - g. Disease in solipeds
  - h. Prevention and control
- 7. Leptospirosis
  - a. Identification
  - b. Occurrence
  - c. Reservoir of infection
  - d. Transmission
  - e. Incubation period
  - f. Disease in man
  - g. Disease in animals
  - h. Prevention and control

8. Listerellosis (Listeriosis)
    a. Identification
    b. Occurrence
    c. Transmission
    d. Incubation period
    e. Disease in man
    f. Disease in animals
    g. Prevention and control
9. Bubonic plague
    a. Identification
    b. Occurrence
    c. Reservoir of infection
    d. Transmission
    e. Incubation period
    f. Prevention and control
10. Rat bite fever (U.S.A.)
    a. Identification
    b. Occurrence
    c. Reservoir of infection
    d. Transmission
    e. Incubation period
    f. The disease in man
    g. The disease in animals
    h. Prevention and control
11. Sodoku (sporadic rat bite fever)
    a. Identification
    b. Occurrence
    c. Fatality

d. Incubation period
e. The disease in man
f. The disease in animals

12. Relapsing fever
    a. Identification
    b. Occurrence
    c. Reservoir
    d. Transmission
    e. Incubation period
    f. Prevention and control
13. Salmonellosis
    a. Identification
    b. Occurrence
    c. Reservoir of infection
    d. Transmission
    e. Incubation period
    f. Prevention and control
14. Staphylococcus disease
    a. Identification
    b. Occurrence
    c. Reservoir of infection
    d. Transmission
    e. Incubation period
    f. Prevention and control
15. Hemolytic streptococcal disease
    a. Types
        1) Scarlet fever and streptococcal sore throat

        2) Erysipelas
        3) Puerperal fever
            a) Identification
            b) Occurrence
            c) Reservoir
            d) Transmission
            e) Prevention and control

16. Tuberculosis
    a. Historical and public health interest
    b. Identification
    c. Occurrence
    d. Resistance of organism
    e. Reservoirs of infection
    f. Transmission
    g. Incubation period
    h. Tuberculosis in the human species
    i. Tuberculosis in the animal species
        1) Cattle
        2) Dogs
        3) Cats
        4) Swine
        5) Equines
        6) Sheep and goats
        7) Poultry
    j. Prevention and control

17. Tetanus
    a. Identification
    b. Occurrence

- c. Reservoir of infection
- d. Transmission
- e. Incubation period
- f. Prevention and control

18. Tularemia
    - a. Identification
    - b. Occurrence
    - c. Reservoir of infection
    - d. Transmission
    - e. Incubation period
    - f. Prevention and control
19. Syphilis (venereal)
    - a. Identification
    - b. Occurrence
    - c. Reservoir of infection
    - d. Transmission
    - e. Incubation period
    - f. Prevention and control
20. Gonococcal disease (gonorrhea)
    - a. Identification
    - b. Occurrence
    - c. Reservoir of infection
    - d. Transmission
    - e. Incubation period
    - f. Prevention and control

TEXT AND REFERENCES

Bruner, W. Dorsey and James H. Gillespie. Hagan's Infectious Diseases of Domestic Animals.

Faust, Beaver and Jung. Animal Agents and Vectors of Human Disease.

Gordon, John E. Control of Communicable Diseases in Man.

Hoerr, N. L. and A. Osol. Blakiston's New Gould Medical Dictionary.

Hull, Thomas G. Diseases Transmitted from Animals to Man.

Merchant, Ival A. An Outline of the Infectious Diseases of Domestic Animals.

Van Der Hoeden, J. Zoonoses.

INSTRUCTIONAL MEDIA

Alden Films (McGraw-Hill), 5113 - 16th Avenue, Brooklyn 4, New York

The Germ Theory of Disease. 16 mm., 28 min., sound, color
Outlines the history of contagion in diseases. Explains host-parasite relationship and discusses Koch's Postulates. Explains symptomology of disease causing organisms.

American Society for Microbiology, 115 Huron View Boulevard, Ann Arbor, Michigan.

Action of Bacteriophage on Typhoid Bacilli. 16 mm., 16 min. silent, black and white.
For film description, write for Abstract #117.

In Vitro Demonstration of Surface Phogocytosis. 16 mm., 12 min., silent, black and white
For film description, write for Abstract #201

Measles in Children. 16 mm., 2 min., sound, color.

For description, write for Abstract #284.

Motility in Bacteria. 16 mm., 8 min., silent, black and white.

For film description, write for Abstract #118

Rabies. 16 mm., 7 min., silent, black and white

For film description, write for Abstract #22

Rabies in a Human Patient. 16 mm., 5 min., sound, black and white.

For film description, write for Abstract #276

Shape and Motility of "Bacteria". 16 mm., 56 min., silent, black and white.

For film description, write for Abstract #153

American Veterinary Medical Association, Film Library,
600 South Michigan Avenue, Chicago, Illinois 60605

Anthrax in Ohio. 16 mm., 25 min., sound, color

This film tells the story of how Anthrax was diagnosed and controlled in an outbreak in Ohio in 1952. An epidemiological approach is presented.

Bluetongue. 16 mm., 9 min., sound, color

A comprehensive description and study on the disease of Bluetongue which was once considered to be an exotic but now appears to be established in this country.

Epidemic Foot and Mouth Disease - Saskatchewan. 16 mm., 16 min., sound, color.

This film is an excellent review on the subject of Foot and Mouth Disease. It illustrates and describes how an outbreak of the disease was quickly and successfully eradicated in Canada in 1952.

Epidemiology of Salmonellosis in Man and Animals.

16 mm., 14 min., sound, color.

The causes, symptoms, and laboratory identification of Salmonella species is emphasized. The economic importance and public health significance of the disease is stressed throughout the film.

Leptospirosis and the Veterinarian. 16 mm., 12 min., sound, color.

This film discusses totally the disease of Leptospirosis, emphasizing communicability and epidemiology. Both the veterinarian and the public health official play vital roles in the film.

Vesicular Exanthema. 16 mm., 16 min., sound, color.

The film tells the story of the 1952 outbread of vesicular exanthema, its rapid spread, and the control measures taken. It demonstrates the Federal-State cooperative efforts in disease control including herd inspection, diagnosis and quarantine, and disinfection. It points out the importance of thorough cooking of all garbage fed to swine in order to prevent spread of contagious diseases.

Association Films, Inc. Schering Professional Film Library, Broad and Elm, Ridgefield, New Jersey 07657

Diagnosis and Management of Fungus Infections of the Skin, Hair and Nails. 16 mm., 30 min., color, sound.

Demonstrates through clinical case presentations, the diagnostic features and management of superficial fungus infections, including use of the antifungal antibiotic, griseofulvin.

Coronet Instructional Films, 65 East South Water Street,
Chicago, Illinois 60601

Infectious Diseases and Man-made Defenses. 16 mm., 11 min., sound, color.

Film shows some of the causes of infectious diseases and explains at length how we use man-made defenses to protect ourselves. The viewer sees how antitoxins, vaccines, antibiotics and synthetic drugs are produced and used to help develop active and passive immunity in the body.

Infectious Diseases and Natural Body Defenses. 16 mm., 11 min., sound, color.

A detailed illustration of inner and outer natural body defenses which guard against disease. A comprehensive approach is taken.

National Medical Audio Visual Center (Annex), Chamblee, Georgia
30005 (Attention: Film Distribution.

Arthropods of Public Health Importance. Film strip (42 frames 1 disc) (12 in. 33 1/3 rpm) 7 min., color.

Shows the outstanding identifying characteristics of one or more species of arthropods of public health importance.

Epidemiology of Brucellosis. Film Strip 86 frames, 35 mm. sound, color.

Explains the epidemiology of Brucellosis in cattle, swine and goats, and its transmission to man. Covers method of infection, course of the disease, and the public health and economic implications.

Plague in Sylvatic Areas. 16 mm., 26 min., sound, color

Shows historical introduction of the disease into Western United States. Discusses importance of the rodent-borne flea as vector and methods of rapid diagnosis and treatment.

New York State Colleges of Agriculture and Home Economics, Film Library Section, Cornell University, Roberts Hall, Ithaca, New York 14850.

Back the Attach on Brucellosis. 16 mm., 27 1/2 min., sound, color.

A U.S.D.A. film showing diagnosis of Brucellosis in an actual dairy herd and the resulting organization and functioning of a county Brucellosis committee. The B.R.T. test is illustrated and the economic importance of this disease to the livestock industry is stressed.

ENGLISH COMPOSITION I (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 3.

DESCRIPTION

A fundamental course in English designed principally to introduce and familiarize the student with recommended methods of expression and interpretation. A study of the characteristics and uses of description, narration and definition are introduced and elaborated through frequent writing exercises aimed at the control of structure and meaning. Emphasis in the instruction of the course is also placed on problems of reasoning; for example, logical fallacies, fact/opinion distinctions, modes of interference and kinds and methods of argument.

This course also provides an effective background for the evaluation and criticism of various types of literature to be considered in English Composition II.

MAJOR DIVISIONS

		Class Hours
I.	Description	6
II.	Content	6
III.	Definition	8
IV.	Progress	6
V.	Reasoning	7
	Total	33

I. DESCRIPTION

Units of Instruction

1. Objectives
    - a. The student should be able to distinguish between description and narration, and between objective and subjective description.
    - b. The student should be encouraged to develop a sensuous awareness in subjective description
    - c. The student should be able to organize the piece of objective description in accord with the subject and purpose of his work and the subjective description in accord with a dominant impression.
2. Content
    - a. A comparative study of descriptive passages with special focus on organization, dictation and purpose.
    - b. An intensive study of the word.
        - 1) denotation and connotation
        - 2) the abstract and the concrete
        - 3) general/specific movement
        - 4) use of figurative language
        - 5) (the cliche, euphemism, jargon)
    - c. Study and student practice in description of persons, places, things, concrete ideas.

II. NARRATION

Units of Instruction

1. Objectives
    - a. The student objectives should be aware of the sequential nature of narration
    - b. The student should be able to select and control the flow of events in a simple, meaningful narration.
    - c. The student should be able to distinguish between objective and subjective tone. (fictional narration, while not a part of this course, is treated in Creative Writing)
2. Content
    - a. A study of selected passages to create the distinctions between technical and creative narration.
    - b. The analysis of:
        - 1) exposition (sequence of events)
        - 2) suspense
        - 3) climax
        - 4) setting
        - 5) characterization
        - 6) pacing
        - 7) general-specific movement
        - 8) other rhetorical devices (irony, antithesis, etc.)
    - c. Writing and criticism of objective and subjective narration

III. DEFINITION

Units of Instruction

1. Objectives
    - a. The student should know how to set systematic limits or qualifications about the object or concepts.
    - b. The student should be able to distinguish between the general detail and the specific detail
    - c. The student should be able to define the abstract in terms of the concrete
    - d. The student should recognize the limitations and possibilities of definition and know how to logically expand the definition given the nature of his subject matter.
    - e. The student should understand the differences between the dictionary definition and other rhetorical definitions
2. Content
    - a. Study of definition (genus, differentiae)
    - b. Study of abstract definition
        1. expansion through analogy
        2. expansion through concrete illustrations
        3. value of contrast in making distinctions
    - c. Practice in several types of definition

IV. PROCESS

Units of Instruction

1. Objectives

a. The student should recognize the sequential, universal nature of process

b. The student should be able to distinguish among causes, functions and effects.

c. The student should be able to analyze simple familiar process, (e.g., registration) and create order in previously undiscerned processes (e. g., the course)

2. Content

a. Study of simple and complicated processes and the organization appropriate to each.

b. Practice in writing about familiar processes and creating order in unfamiliar ones.

V. REASONING

Units of Instruction

1. Objectives

a. The student should be able to distinguish between fact and opinion in his own writing and in the writing of others.

b. The student should recognize the need to test the validity of opinions (in his own writing and in the writing of others) on the basis of internal consistency (see C) and on the basis of actual practice.

c. The student should become familiar with various kinds of logical fallacies and learn the means of avoiding same in his own writing.

        1) hasty generalization
        2) drawing unqualified conclusions from analogies
        3) begging the question
    d. The student should learn the value of making careful distinctions in his writing, for both the purpose of precision in his own thinking and the resolution of ambiguity in his reader's mind.
    e. The student should learn the various bases of inference: classification (x includes y), time sequence (x entails y), personal experience, and analogy. He should also learn the limitations of each through practice in his own writing.
    f. The student should learn the kinds and methods of argument.
2. Content
    a. A comparative study of the reasoning in short passages and whole essays
    b. Writing practice.

TEXT AND REFERENCES

Buckler, W. and A. Sklare. Essentials of Rhetoric.
Collier, P. Crisis: A contemporary Reader.
Kytle, R. Clear Thinking For Composition.
Major, J. The Search For Self.

INTRODUCTORY SOCIOLOGY (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 3.

DESCRIPTION

This course is designed to introduce the student to the social forces which influence and shape the society in which he lives. In accomplishing this objective, a background in sociology is established by examining some of the more important social problems of contemporary man in Western society. Areas of social impact which will be probed in depth include race relations, the urban community, the evolution of American institutions and values, socialization and problems of life in mass technocracy.

To provide the student with a more extensive appreciation of social influences relating to his own life; seminars on current social issues, selected readings and class discussions are integrated into the content of this course.

MAJOR DIVISIONS

		Class Hours
I.	Introduction to Sociology	2
II.	Social Organizations	2
III.	Culture	2
IV.	Socialization	2
V.	Social Stratification	2
VI.	Associations	2
VII.	Collective Behavior	2

VIII.	Demography	2
IX.	Religion In Contemporary America	2
X.	Urban Man	5
XI.	Contemporary Race Relations: The Negro in America	5
XII.	Social Change In Contemporary America	5
	Total	33

I. INTRODUCTION TO SOCIOLOGY

Units of Instruction

1. Objectives
    - a. To provide a comprehensive introduction to the study of sociology.
    - b. To define and discuss major differences in the salient characteristics of animal and human societies. To establish distinct and exclusive categories of (1) biologically determined and (2) culturally determined behavioral mechanisms and concomitant functions.
    - c. To acquaint the students with the major ethologists and their major works.
    - d. To develop within the student a basic understanding of the sociological perspective, i.e., to enable "thinking like a sociologist" as the course is undertaken.
2. Content
    - a. The discipline of sociology. Historical antecedants from social philosophy. The major

theorists of the nineteenth century and their contributions.

b. The study of animal societies, i.e., "Societies without culture.

c. Recommended Reading: Animals as Social Beings.

II. SOCIAL ORGANIZATION

Units of Instruction

1. Objectives

   a. To provide the student with a basic knowledge of social systems and levels of social organization.

   b. To teach the interactive relatedness between men and society

   c. To provide specific sociological examples of social integration at various levels, and the effect of this relative to behavioral response.

   d. To provide for a discussion on integrative mechanisms, which serves to establish the basis for a seminar on "Conformity Vs. Individualism" in American life. This attempts to develop insights within the human condition relative to individualism and group-relatedness in contemporary society.

2, Content

   a. Study of "Park Forest" suburbia from general discussion to life style of ORGANIZATION MAN in society.

b. Overview of major findings of Durkheim's classic SUICIDE; study of factors of societal integration and disintegration

c. Coverage of Reisman's THE LONELY CROWD as a commentary on factors of disintegration in contemporary mass society.

III. CULTURE

Units of Instruction

1. Objectives

   a. To establish the concept of culture as a shared symbolic system, have students define this concept relative to the areas of the culture in which they participate, and provide a cultural construct obtained from relevant examples.

   b. Provide an understanding relative to how human behavior is constrained by culture-bound sanctions, modes of behavioral action, rules, laws, folkways, etc.

   c. To provide a basic understanding of the factors of ethnocentrism and cultural relativity, employing specific anthropological analogies to American cultural processes.

   d. To study the role and purpose of emergent sub-cultures in contemporary American society.

2. Content

   a. The concept of culture

   b. SEMINAR: "How do American culture-bound life patterns shape the 'American personality' or 'National character'"

IV. SOCIALIZATION

Units of Instruction

1. Objectives
   - a. To set forth an understanding of the socialization process, so the student will attain an enriched understanding of how a given society "molds" its members for functional roles in its workplace.
   - b. To aid the student in establishing an understanding as to how he has progressed through a complex process of personal socialization, and will continue to do so.
   - c. To create an understanding of how the rational goals of the individual mesh with the rational, expedient goals of the society at large; discussion will be oriented toward the sociatal effects of dysfunction relative to this process.
2. Content
   - a. Primary group relatedness and socialization
   - b. Secondary group relatedness and socialization.
   - c. Discussion:
     - 1) Socialization in a military academy
     - 2) Socialization in a college fraternity
     - 3) Differential concepts and conflicts of socialization relative to the processes of (A) enculturation and (B) acculturation.

V. SOCIAL STRATIFICATION

Units of Instruction

1. Objectives
    a. To provide an understanding of the class system in America and how different theorists depict it.
    b. To parallel this with a discussion of class syste in traditional European and Asian countries, so the student may gain a broader perspective in this area.
    c. To provide an understanding relative to how status and life style are correlates of social stratification.
    d. To have the student examine the class configuration in his own community, while trying to relate his construct or model to one of the models given in class.
2. Content
    a. Selected reading from:
        1) Small Town in Mass Society. Vidich, Bensman
        2) Social Class in America. W. L. Warner
        3) Caste and Class in a Southern Town. Dollard
    b. Specific readings will relate to class interest and time factor.

VI. ASSOCIATIONS

1. Objectives
    a. To establish an understanding of the nature and structure of formal and informal associations

and organizations.

b. To discuss the mechanisms by which factors of cohesion, morale, status, communication, and social and economic expediency are attained in formal and informal associations, i.e., how the individual is behaviorally constrained by virtue of associational integration. Factors of dysfunction will also be discussed.

c. To aid the student in understanding the nature and function of a bureaucratic system. To provide a basic explanation of why a bureaucracy is the most efficient and expedient type of organizational setup in mass society.

2. Content

a. Reading:

1) From Max Weber (Part II; "Power")

2) The Theory of Social and Economic Organization.

3) Weber-Part III: "The Types of Authority and Imperative Coordination".

VII. COLLECTIVE BEHAVIOR

Units of Instruction

1. Objectives

a. To establish an understanding of the nature, conditions, and differential forms of collective human behavior.

b. To relate #1 to contemporary phenomena such as emotional contagion, race riots, and the activities of crowds and mobs (i.e., expressive behavioral practices

c. To demonstrate how the individual is behaviorally constrained by virtue of group membership and affiliation.

2. Content

a. Class exercise: The class will attempt to employ ideas and concepts previously learned by correlating the SMELSER VALUE ADDED THEORY OF COLLECTIVE BEHAVIOR with the LEEVILLE (TEXAS) LYNCHING CASE.

The specific theory will be explained and outlined; the class will attempt to apply it as the sequential incidents are read.

VIII. DEMOGRAPHY

Units of Instruction

1. Objectives

a. To introduce the basic concepts of population and the ecological imperative in contemporary American society.

b. To evaluate collectively contemporary population trends insociety relative to current social and economic problems

c. To acquaint the student with the general function of the demographic perspective as it applies to the needs of government, industry and society in general.

2. Content

    a. Reading:

        1. Population and Society. Random House paperback by D. Wrong

IX. RELIGION IN CONTEMPORARY AMERICA

Units of Instruction

1. Objectives

    a. To enable the student to evaluate and understand the nature of, and constraining forces relative to, the religious response as a culturally-created behavioral manifestation.

    b. To acquaint the student with the historical perspective of religion, with an emphasis on the evolutionary development of Western religious behavior.

2. Content

    a. Recommended Reading:

        1. The Varieties of Religious Experience
        William James

        2. The Individual and His Religion
        G. W. Aliport

    b. SEMINAR: "The Relevance of Religion in America Today"

    "The New Theology"

X. URBAN MAN

Units of Instruction

1. Objectives
    - a. To provide an historical background for the student so that he may gain an understanding of man in the urban setting.
    - b. To promulgate an explanation of the problems of man in the Western urban setting, with an emphasis on the emergence of the Industrial Revolution and its aftermath.
    - c. To relate the urban community to its unique current social, political, and economic problems. To foster an increased understanding in these areas.
2. Content
    - a. Selected readings;
        - 1) 1968 Washington Seminar Overview
        - 2) Urban Renewal: People, Politics, and planning.

XI. CONTEMPORARY RACE RELATIONS: THE NEGRO IN AMERICA

Units of Instruction

1. Objective
    - a. To examine the area of contemporary racial problems in America, with an emphasis on the plight of the Negro.
    - b. To examine historically the role of the Negro in the developmental growth of the American republic.

c. To aid students in learning to examine blasen, prejudicial judgement and behavior, etc., on a critical basis. To bring about attitudinal change relative to traditional perspectives held toward racial minorities.

2. Content

a. Reading of Dark Ghetto in its entirety

b. Recommended Reading:

1. The Nature of Prejudice - Allport

2. Racial Crisis in America. Killian and Grigg

c. SEMINAR (Debate): "Is the current racial movement indicative of a positive or negative action, relative to the Negro's genuine need for egalitarian treatment in American Society"? Specific reading will depend upon (1) class interest and (2) time factor.

XII. SOCIAL CHANGE IN CONTEMPORARY AMERICA

Units of Instruction

1. Objectives

a. To provide an explanation of social change factors in the context of contemporary American society.

b. To review and apply classical sociological theory to specific factors of contemporary change, such as differential suicide rate, social integration and disintegration, social conflict and dysfunction, social movements, the emergence of new groups, the emergence of new ethics, slogans, and symbols, the changed concepts of traditional symbols (such as patriotism), and role change.

c. To help students develop a perspective relative to a philosophy of life that is sufficiently flexible to incorporate the phenomena of accelerated change.

d. To provide students the opportunity to discuss change factors relative to their own problems, lifeways, and traditionally-held perspectives.

2. Content

   a. SEMINAR ON SOCIAL CHANGE

   b. Topics:

      1. "Humanism and Technocracy"
      2. "Life in the Post-Christian Era"
      3. "Situation Ethics: The New Morality"?
      4. "What Philosophy of Life in Time of Change"?

   c. Reading:

      1. Sociology: Social Structure and Change by B. S. Philips, Chapter 17. "Theories of Change"

TEXT

Broom and Selznick. Sociology: Text With Adapted Readings.

REFERENCES

Allport, G. W. The Individual and His Religion.

Allport, G. W. The Nature of Prejudice.

Brown. Understanding Other Cultures.

James, W. The Varieties of Religious Experience.

Lorenz, C. King Soloman's Ring.

ANIMAL SCIENCE TECHNOLOGY CURRICULUM

THIRD TERM COURSE SCHEDULE

Animal Reproduction 119
Clinical Management 136
Mammalian Physiology 160
Applied Microbiology 181
Introductory Psychology 201

ANIMAL REPRODUCTION

HOURS REQUIRED

Class, 3.

DESCRIPTION

To provide a basic knowledge of reproductive processes in domestic animals. To give the student the necessary background to enable him to manage reproductive efficiency in domestic animals and to be able to recognize the presence of abnormal conditions and when to seek veterinary assistance with reproductive disorders.

MAJOR DIVISIONS

		Class Hours
I.	Anatomy of the Reproductive System	3
II.	Hormonal Physiology	3
III.	Estrus Cycles	2
IV.	Sperm and Ova	1
V.	Artificial Insemination	2
VI.	Pregnancy	3
VII.	Behavior	4
VIII.	Species Reproduction	6
IX.	Reproductive Failure	4
X.	Reproductive Diseases	5
	Total	33

I. ANATOMY OF THE REPRODUCTIVE SYSTEM

Units of Instruction

1. Female reproductive system
    - a. Components
        - 1) Ovary
        - 2) Fallopian tubes
        - 3) Uterus
        - 4) Vagina
        - 5) Vulva
    - b. Basic processes
        - 1) Ovum production
        - 2) Fertilization
        - 3) Gestation
        - 4) Parturition
2. Male reproductive system
    - a. Components
        - 1) Testes
        - 2) Scrotum
        - 3) Accessory glands and ducts
        - 4) Penis
    - b. Testicles
        - 1) Seminiferous tubules
        - 2) Tunica albuginea
        - 3) Cells of Leydig
    - c. Spermatogenesis
        - 1) Germinal epithelium
        - 2) Sperm maturation
        - 3) Chromosomal numbers

        - 4) Sustentacular cells of Sertoli
        - 5) Sertoli cell tumors
    - d. Epididymus
    - e. Vas deferens
    - f. Scrotum
    - g. Testicular descent
    - h. Spermic cord
    - i. Castration
    - j. Accessory sex glands
    - k. Penis
- 3. Embroyological derivation
    - a. Indifferent stages
        - 1) Genotypical determination
        - 2) Bisexual stages
        - 3) Hormonal theory
        - 4) Remnant ducts systems
    - b. Structures
        - 1) Gonad
        - 2) Mesonephric duct
        - 3) Mullerian duct
        - 4) Urogenital sinus
        - 5) Genital tubercle
        - 6) Urethral folds
        - 7) Labioscrotal swellings

II. HORMONES

Units of Instruction

1. Mechanisms
    a. Feedback mechanism
    b. Gland types
        1) Thyroid
        2) Ovary
        3) Pituitary
2. Pituitary
    a. Master gland concept - homeostasis
    b. Location
        1) Sella turcica
    c. Anterior lobe
        1) Leuteinizing hormone
        2) Follicle stimulating hormone
        3) Prolactin
        4) Adrenocorticotropic hormone
        5) Thyroid stimulating hormone
        6) Somatotropic hormone
        7) Interstitial cell stimulating hormone
    d. Posterior lobe
        1) Oxytocin
        2) Anti-diuretic hormone (vasopressin)
    e. Hypophysectomy
        1) Results
    f. Cyclic activity
        1) Pituitary - FSH - estrogen relationship
        2) FSH function

            - 3) LH function
            - 4) Stimulation vs inhibition
            - 5) Ovulation
            - 6) Estrogen
            - 7) Progesterone
        - g. Hormone interrelationships during ovulation
    - 3. Adrenal gland
        - a. Cortex
        - b. Medulla
        - c. Sex hormones
    - 4. Thyroid gland
        - a. Thyroglobin
        - b. Function
    - 5. Parathyroid glands
    - 6. Pancreas
        - a. Islets of Langerhans
        - b. Alpha, beta and delta cells
            - 1) Beta cell insulin production
            - 2) Alpha cell glucagon production
    - 7. Pineal gland
    - 8. Thymus gland

III. ESTRUS CYCLES

Units of Instruction

- 1. Breeding seasons
    - a. Environmental factors
    - b. Continuous breeders
    - c. Seasonal breeders
    - d. Light effects

2. Cycles
    a. Heat periods
    b. Postpartum heat
    c. Rat cycle
    d. Ovulation
    e. Menstrual cycle

IV. SPERM AND OVA

Units of Instruction

1. Sperm
    a. Anatomy
    b. Development process
        1) Spermatogonia
        2) Spermatocytes
        3) Spermatids
        4) Sperm
    c. Sertoli cells
    d. Epididymus
2. Abnormal spermatozoa
    a. Sterility
    b. Head abnormalities
    c. Tail abnormalities
    d. Occurrence
3. Ovum
    a. Anatomy
    b. Development process
        1) Oogonia
        2) Oocyte
        3) Polar bodies

        - c. Life span
        - d. Fertilization

V. ARTIFICIAL INSEMINATION

Units of Instruction

1. Semen collection
    - a. Artificial vagina
    - b. Electroejaculation
2. Semen storage
    - a. Temperature
    - b. Extender
    - c. Freezing semen
3. Sperm quality

VI. PREGNANCY

Units of Instruction

1. Fertilization and implantation
    - a. Female
        - 1) Ovulation
        - 2) Oiduct
        - 3) Fate of ovum
    - b. Male
        - 1) Coitus
        - 2) Sperm storage
        - 3) Ejaculation
        - 4) Sperm transport
        - 5) Sperm life
    - c. Capacitation
    - d. Fertilization events
        - 1) Penetration

        - 2) Spermatic enzyme
        - 3) Zona pellucida
        - 4) Superspermation
        - 5) Pronuclei
        - 6) Chromosomal occurrences
        - 7) Reassocition of chromosomes
        - 8) Sex determination

2. Development
    - a. Blastula
    - b. Gastrula
3. Implantation
4. Gestation
    - a. Duration
    - b. Placentation
    - c. Uterine growth
    - d. Pregnancy diagnosis
        - 1) Clinical diagnosis
        - 2) Late pregnancy changes
        - 3) Radiological diagnosis
        - 4) Biological diagnosis
        - 5) Chemical diagnosis
5. Parturition
    - a. Presentation of fetus
    - b. Stages of labor
    - c. Parturition initiation
6. Lactation
    - a. Mammary gland growth

- b. Initiation of lactation
- c. Milk let-down
- d. Involution

VII. BEHAVIOR

Units of Instruction

1. Sexual behavior
   - a. Male sexual behavior
   - b. Female sexual behavior
   - c. Sensory sexual stimuli
   - d. Sexual behavior and reproductive efficiency
   - e. Abnormal sexual behavior
2. Maternal behavior
   - a. Introduction
     - 1) Economic importance
     - 2) Primiparous and multiparous females
     - 3) Maternal care
   - b. Parturition
   - c. Nursing behavior
3. Neonatal behavior
   - a. Suckling
   - b. Play
   - c. Abnormal behavior

VIII. SPECIES REPRODUCTION

Units of Instruction

1. Bovine reproduction
   - a. Bull
     - 1) Semen volume
     - 2) Accessory glands

    3) Semen extenders
    4) Conception rates
    5) Artificial insemination
  b. Cow
    1) Estrus cycle
    2) Signs of estrus
    3) Ovulation patterns
  c. Libido
  d. Fertilization
  e. Parturition

2. Equine reproduction
  a. Breeding
    1) Seasonal breeder
    2) Estrus period and cycle
    3) Breeding precautions
    4) Breeding behavior
    5) Equipment for restraint
    6) Use of teaser male
  b. Mare
    1) Estrus signs
    2) Frequency of coverage
    3) Hormone balance
    4) Silent heat
    5) Puberty
    6) Breeding age
  c. Mating equines
  d. Pregnancy tests

3. Ovine reproduction
    a. Sexual maturity
        1) Ram
        2) Ewe
    b. Breeding season
        1) Ram - seasonal variation
        2) Ewe - daylight factor
    c. Estrus and ovulation
    d. Pregnancy and parturition
    e. Management
4. Porcine reproduction
    a. Sexual maturity
        1) Boar
        2) Sow
    b. Estrus and ovulation
    c. Pregnancy
5. Canine and feline reproduction
    a. Canine
        1) Puberty
        2) Estrus cycle
        3) Signs of estrus
        4) Stages of estrus
        5) Gestation
    b. Feline
        1) Puberty
        2) Coital stimulated ovulation
        3) Estrous cycle and variations

        - 4) Seasonal polyestrous
        - 5) Gestation
    - c. Pseudopregnancy
    - d. Prevention of pregnancy
    - e. Reproductive problems
    - f. Artifical insemination

IX. REPRODUCTIVE FAILURE

Units of Instruction

1. Female reproductive failure
    - a. Ovulation
        - 1) Split estrus
        - 2) Gonadal hypoplasia
        - 3) Silent heat
        - 4) Cystic ovaries
        - 5) Nymphomania
        - 6) Artificial cycling
    - b. Fertilization
        - 1) Aged ovum
        - 2) Aged sperm
        - 3) Polyspermy
        - 4) Monospermic fertilization
        - 5) Pronuclei failure
    - c. Pregnancy
        - 1) Prenatal mortality
        - 2) Spontaneous abortion
        - 3) Metabolic disorders of pregnancy
        - 4) Prolonged gestation
        - 5) Mummification

            6) Fetal and maternal dystocia
            7) Neonatal death
            8) Retained placenta
            9) Prolapsed uterus
            10) Postnatal complications
    2. Male reproductive failure
        a. Spermatogenesis
            1) Neoplasia
            2) Testicular hypoplasis
            3) Cryptorchidism and monorchidism
            4) Duct abnormalities
            5) Inguinal hernia
            6) Abnormal acrosome caps
            7) Hormonal disorders
        b. Other causes
            1) Fever
            2) Retractor penis failure
            3) Thyroid failure
            4) Hormal factors

X. REPRODUCTIVE DISEASES

Units of Instruction

1. Diseases related to pregnancy
    a. Ectopic pregnancy
    b. Umbilical cord
    c. Labor-related abnormalities
    d. Neoplasms
2. Fetal diseases
    a. Anomalies

        - b. Erythroblastosis fetalis
        - c. Prolapse
    - 3. Metabolic diseases
        - a. Milk fever
        - b. Ketosis
        - c. Grass tetany
        - d. Eclampsia
    - 4. Retained placenta
        - a. Cause
        - b. Diseases
        - c. Uterine inertia
        - d. Treatment
    - 5. Septic metritis
    - 6. Equine reproductive diseases
        - a. Predisposing factors
            - 1) Windsucking
            - 2) Dystocia
            - 3) Improper breeding hygiene
        - b. Bacterial diseases
        - c. Post-partum metritis
        - d. Abortion
            - 1) Equine viral rhinopheumonitis
            - 2) Equine viral arteritis
            - 3) Other causes
    - 7. Abortion diagnosis
        - a. Individual history
        - b. Herd history
        - c. Laboratory samples

8. Diseases causing abortion
    a. Trichomonas fetus
    b. Vibrio fetus
    c. Brucella abortus
    d. Leptospira pomona
9. Miscellaneous abortion
    a. Secondary abortion
        1) Equine influenza
        2) Bovine tuberculosis
        3) Bovine viral diarrhea
        4) Toxoplasmosis
        5) Anthrax
        6) Shipping fever complex
        7) Canine distemper
    b. Miscellaneous bacteria
        1) Escherichia coli
        2) Shigella-Salmonella
        3) Pasturella
        4) Others
    c. Mycotic abortion
    d. Toxic abortion
        1) Chlorinated napthalenes
        2) Nitrate poisoning
        3) Lead arsenic
        4) Ergotism
        5) Other agents
    e. Metabolic abortion
    f. Traumatic abortion
    g. Therapeutic abortion

TEXT AND REFERENCES

Brown, J. H. and S. B. Barker. Basic Endocrinology.

Nalbandov. Reproductive Physiology.

Netter, Frank H. CIBA Collection of Medical Illustrations Volume 2 Reproductive System.

Netter, Frank H. CIBA Collection of Medical Illustrations Volume 4 Endocrine System.

Sigmund, O. H. Merck Veterinary Manual.

INSTRUCTIONAL MEDIA

American Medical Association Library, Chicago, Illinois

Physiology of Reproduction in the Rat. 16 mm., 19 min., sound, color.

Female rat behavior in and out of estrus. Male behavior during different phases of cycle.

Audio-Visual Support Center, U. S. Army.

Anatomy and Physiology: The Endocrine System. Silent film strip, 66 frames, 15 min., record disc.

Defines endocrine system location, structure and function.

Encyclopedia Brittanica Films Inc., Wilmette, Illinois.

Endocrine Glands. 16 mm., 11 min., sound, black and white.

Describes glands of internal secretion and physiology of each.

Lambing (Parturition in The Ewe) 16 mm., 20 min., sound, black and white.

Techniques for proper delivery of pregnant ewe with obstetrical methods used in normal and abnormal births.

Reproduction Among Mammals. 16 mm., 11 min., sound, black and white.

Embryological development of domestic pig.

McGraw-Hill Book Company Inc. 42nd Street, New York, New York.

Endocrine Glands, How They Affect You. 16 mm., 15 min., black and white, sound.

Animated drawing technique showing location and function of endocrine glands and hormones.

Psychological Cinema Register, Pennsylvania State University, University Park, Pennsylvania.

Social Behavior of the Rhesus Monkey. 16 mm., 26 min., sound, black and white.

Social interactions of rhesus monkeys in groups or individual interactions with emphasis on reproductive behavior and maternal behavior.

CLINICAL MANAGEMENT

HOURS REQUIRED

Class, 3; Laboratory, none

DESCRIPTION

This course is designed to familiarize students with techniques and procedures which are largely para-professional in nature. In a veterinary hospital, these practice functions are performed by or carried out under the veterinary technician's supervision, relieving the doctor of time he urgently needs for attending to more professional matters. Emphasis and instruction during the course will therefore be related to the following: veterinary practice ethics, hospital-client relations, records kept in veterinary medical practice, pharmacy operation, surgical and medical assisting techniques, principles of human relations, animal restraint methods and other related practice techniques.

This course in certain areas particularly, builds on earlier basic science courses such as microbiology and anatomy-physiology. In so doing it provides the information and skills needed by the technician for assisting the doctor as a medical-surgical nurse, surgical technician, receptionist, office secretary, bookkeeper, pharmacist or other as the need demands.

While becoming oriented to the many phases of veterinary hospital operation and management, the student should gain an appreciation for professional veterinary practice ethics.

Likewise instruction is intended to provide an understanding of the legal status of the para-professional in a veterinary medical practice. Additionally, guiding principles in human relations for those supervising subordinate personnel are presented. Lastly, students are advised how to best handle, in terms of restraint, small patients as seen daily in practice situations.

Three hourly lectures weekly serve to outline the course material. Exams and quizzes will be given during this time also to give instructional variety to the course, motion picture films, filmstrips, 2 x 2 slides and video tapes supplement lecture material when these are available. To provide relevance, guest speakers from the professional sphere will bring a selected number of lectures. Examples of the type of guest speakers utilized are: a member of a veterinary college faculty, a prominent veterinary practitioner, a graduate 2 year trained technician currently employed at a veterinary hospital, and a sales representative from a leading veterinary pharmaceutical house. Students who have had previous experience working as assistants in a veterinary hospital are encouraged to relate their experiences or to offer other clinical practice tips which might have merit and interest for all.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. Course Introduction	1 1/2	None
II. Principles of Veterinary Medical Ethics and Jurisprudence	4	
III. Definition and Legal Status of the "Veterinary Technician" in Veterinary Medical Practice	2	
IV. Areas of Ancillary Service Performed by or Under the Supervisory Responsibility of the Veterinary Technician		
A. Client Reception	3	
B. Role of Office Secretary	2 1/2	
C. Bookkeeping Responsibilities	4	
D. Drug Handling, Dispensing and Related Pharmaceutical Activities	4	
E. Examination and Treatment Room Assistant	1/2	
F. The Surgical Technician's Role	3	
G. Duties and Responsibilities of the Surgical-Medical Nurse	3	
H. Clinical Laboratory Techniques	1/2	
I. Discharging Hospital Patients	1/2	

	Class Hours	Laboratory Periods
V. Human Relations (and the Supervisor)	3	
VI. Principles of Small Animal Restraint and Related Techniques	1 1/2	
Total	33	0

I. COURSE INTRODUCTION

Units of Instruction

1. Philosophy of veterinary technician training and utilization in practice
2. Survey of experience in veterinary practices by class members
3. Synopsis of work areas and responsibilities delegated to the technician in a veterinary practice
    a. Receptionist
    b. Secretary
    c. Bookkeeper
    d. Pharmacist
    e. Examination and treatment room assistant
    f. Surgical technician
    g. Surgical and medical animal nurse
    h. Laboratory technician
    i. Hospital para-professional personnel supervisor

II. PRINCIPLES OF VETERINARY MEDICAL ETHICS AND JURISPRUDENCE

Units of Instruction

1. History and need for development of a code of professional conduct

2. General deportment of veterinary personnel
3. Professional advertising
4. Sacrificing professional integrity for monetary gain
5. Seeking to assist the profession in upgrading of veterinary service to public
6. Weeding incompetant individuals from the veterinary profession; upholding the honor and dignity of the profession and accepting its self-imposed discipline
7. Civic and community spirit and service
8. Definitions of types of veterinary servicing units
    a. Veterinary or Animal Medical Center
    b. Veterinary or Animal Clinic
    c. Veterinary or Animal Hospital
9. The ethics of veterinary hospital-client relations
    a. Confidental matters
        1) Case histories
        2) Client financial problems
        3) Case for breach of confidence
    b. Client selection
    c. Payment for services
        1) Fees charged
        2) Fee splitting
10. Citizenship responsibilities
    a. Definition and importance
    b. Examples of fulfilling these responsibilities
11. Ethical relationships with colleagues and competing veterinary hospitals.

III. DEFINITION AND LEGAL STATUS OF THE "VETERINARY TECHNICIAN" IN VETERINARY MEDICAL PRACTICE

Units of Instruction

1. Comparison between the training, education and licensure requirements of the veterinary professional and the veterinary technician
    a. Doctor of veterinary medicine
    b. Two year Associate in Applied Science Veterinary Technician
2. The State Veterinary Medical Practice Act and its definition of the technician role.
3. Liability for technical assistants in practice
    a. Ultimate responsibility
    b. Emergency situations
4. Malpractice and negligence
    a. Examples
    b. Importance of legal records

IV. AREAS OF ANCILLARY SERVICE PERFORMED BY OR UNDER THE SUPERVISORY RESPONSIBILITY OF THE VETERINARY TECHNICIAN

Units of Instruction

1. Client reception and the psychology of handling clients
    a. The "Image Builder"
        1) What is an "Image" (identification)
        2) 3 Images that are perceived
        3) Essential factors which contribute to a proper "Image"
            a) Health
            b) Grooming

- c) Discretion in dress
- d) Friendly personality
  - (1) Goal commitment
  - (2) Concern for others

b. Psychology of working with clients

- 1) Building a good rapport
  - a) Understanding client needs
  - b) Becoming client "oriented" (tuned in)
    - (1) Attitude of good host
    - (2) Listening to clients problems
    - (3) Communication with client
  - c) Dealing with emotionally upset clients

c. Receiving clients

- 1) Opening the office
- 2) General considerations
- 3) Problem clients
- 4) Making appointments
  - a) Consistent with hospital capabilities
  - b) "Double booking"
  - c) Referral cases
- 5) Hospital workslip

2. The Role of Office Secretary

a. Handling the office mail and correspondence

b. Keeping historical records

- 1) Daily log book
- 2) Filing case histories, etc.
  - a) Current - client files

b) Client - "dead" files
c) Correspondence
(1) Alphabetical
(2) Cross referencing
3) Ownership of p/c records
4) Confidential treatment of records
c. Telephone technique
1) Importance of the telephone "image"
2) Qualities of a good telephone voice
3) Courtesy as it relates to use of the telephone
4) Rules for answering incoming calls
5) Special considerations pertaining to "house" or "farm" call appointments
a) Securing total information
b) What constitutes "Emergency" calls
c) Instructions for doctor if farmer will not be available
6) Recording telephone messages
7) Quick reference list of most frequently called numbers
8) Telephone answering service
a) Personal type
b) Automatic recording system
9) Two way radio operation
3. Bookkeeping responsibilities
a. Reasons why a veterinary medical office must

keep accurate, concise financial and business operation records

b. Kinds of veterinary practice records and summaries kept daily, monthly and yearly (The Histacount Key-Master Bookkeeping System will be utilized as a typical system available for use)
    1) The Daily "Log" (appointment) book
        a) Contents and making entries
        b) Transferring information to individual p/c account and historical cards
        c) Transferring daily totals
    2) Individual p/c financial account record
    3) Monthly earnings summary record
    4) Yearly earnings summary record
    5) Income other than from practice
    6) Deductible disbursements other than from practice
    7) Monthly practice disbursements
    8) Yearly disbursement summary record
    9) Asset depreciation record
    10) Yearly depreciation summary
    11) Computation of net income for year
    12) Financial statement
    13) Individual pay roll record
    14) Payroll recapitulation sheet

c. Check book records and disbursements

- 1) Record of disbursements
- 2) Cross referencing on daily expense record
- 3) Record of deposits
- 4) Bank statement reconcilliation

d. Income tax records

- 1) Basis for income tax
- 2) Two methods in use for income tax computation and reporting
  - a) Cash
  - b) Accrual
- 3) Forms required for reporting tax
  - a) 1040
  - b) 1040 (Schedule C)
  - c) W-2
  - d) W-3

e. Withholding taxes (other than Income Tax)

- 1) Social Security
  - a) Monthly deposits of withholding tax
  - b) Quarterly payments and reports to I.R.S.
  - c) Forms required
    - (1) W-4
    - (2) SS-5
    - (3) 941
    - (4) 450
    - (5) W-2
  - d) Computation of Social Security Tax (F.I.C.A.)

            e) Persons exempted from paying S.S. tax
        2) Federal Unemployed Tax Act
        3) State Unemployment Tax Act
        4) Workmen's Compensation (Insurance)

4. Drug Handling, Dispensing, related pharmaceutical activities
    a. Definitions of terms relating to drug handling
    b. Types of veterinary drug suppliers
    c. Kinds of drugs and pharmaceuticals sold by biological and pharmaceutical houses
        1) Categories
            a) Biologicals
                (1) Methods of vaccine production
                (2) Packaging, care and use of veterinary biologicals
            b) Pharmaceuticals
                (1) Brand name items
                (2) Generic names
                (3) Categories of pharmaceuticals
            c) Antibiotics
            d) Chemotherapeutic agents
    d. Ordering drugs
    e. Price discounts
    f. Transportation costs
    g. Narcotics registry number
    h. Return of merchandise
    i. Damage shipments

j. Drug inventories

k. Understanding prescriptions

  1) Definition of Rx

  2) Essential parts of a classical prescription

  3) Common Rx abbreviations

  4) Weights and measures

    (a) Metric

    (b) Apothecaries

    (c) Conversion equivalents

  5) Practice problems involving Rx writing and drug dispensing

l. Drug administration

  1) Factors responsible for variation in response to drugs administered

  2) Methods of drug administration

    (a) Per orally

      (1) Advantages

      (2) Disadvantages

      (3) Restraint and method of administration

      (4) Gastric lavage

    (b) Parenteral

      (1) Equipment needed

      (2) Aseptic technique and preparation of parenteral medications

      (3) Dangers to be aware of with parenteral injections

  3) Definition of terms related to drug administration

            - a) Hematoma
            - b) Perivascular
            - c) Intraarterial
            - d) I.D. - Intradermal
            - e) I.P. - Intraperitoneal
            - f) I.T. - Intrathoracic
            - g I.C. - Intracardial

5. The examination and treatment room assistant
    - a. Taking and recording of medical case history of patient
    - b. Preparation of examination room at start of office hours and between patients
    - c. Assisting the doctor with examination and treatment
        - 1) Restraint
        - 2) Mixing or preparation of vaccines or medicines
        - 3) Making out certificates (Rabies vaccine, etc.)
        - 4) Dispensing follow up medicines as per doctor's Rx
6. The surgical technician's role
    - a. Cleaning up after surgery
        - 1) Gowns, drapes, etc.
        - 2) Instruments
        - 3) Tissues surgically removed
            - a) Biopsy materials
            - b) Waste

b. Preparation of packs for resterilization
    1) Gowns
    2) Drapes
    3) Sponges
    4) General or "spay" packs
    5) Specialized surgical tray packs (orthopedic, eye)
c. Sterilization techniques
    1) Types
        a) Chemicals
        b) Heat
            (1) Dry
            (2) Boiling
            (3) Steam under pressure (autoclave)
        c) Gas
    2) Special considerations
        a) Rubber goods
        b) Instruments with cutting edge
d. Restocking and preparing surgery and "prep" rooms
    1) Surgeon's "prep" room
        a) Caps and masks
        b) Scrub brushes and surgical soap
        c) Arm immersion disinfectant
    2) Patient prep room
        a) Table and bath tub
        b) Anesthetic and/or preanesthetics, needles, syringes

    - c) Clippers
    - d) Vacuum cleaner
    - e) Surgical soap, ether, alcohol, sponges
    - f) Animal stretcher (transportation cart)
    - g) Recovery cage
    - h) Intensive care equipment and supplies
    - i) Antibiotics and other medicines and and after care
- 3) Surgery room
    - a) Rotation of outdated "sterilized" packs
    - b) Surgical equipment in readiness
        - (1) Hydraulic table, drains, and animal restraint ties
        - (2) Operating lights
        - (3) Instrument stands, I.V. stand, and kick buckets
        - (4) Chemically sterilized instruments and transfer forceps
        - (5) Volatile anesthetic machine
        - (6) Oxygen apparatus (if separate)
        - (7) Suction apparatus
        - (8) Electro-surgical apparatus
        - (9) Specialized equipment (electrocardiograph, defibrillator, etc.)
    - c) Surgical supplies
        - (1) suture (not heat sterilized)

(2) Anesthetic refill

(3) Exchange of soda lime (anesthetic machine)

(4) Emergency drug kit

(5) Extra sterile gauze sponges

d) Operation of the gaseous anesthesia machine during surgery

7. Duties and responsibilities of the surgical-medical nurse.

a. Procedures involved in surgical assisting

1) General considerations

2) Preparation of the patient for surgery

3) Preparation of the surgeon and surgical assistant for surgery

4) Technique for "setting up" operating area for aseptic surgery

5) Assisting during surgery

a) Anticipating surgeon's needs

b) Controlling bleeding

c) Final suturing

d) Monitering plane of anesthesia

(1) Additional anesthetic

(2) Anesthetic antagonists

(3) Emergency drugs or equipment

e) Blood or fluid administration

6) Immediate post-surgical treatment of patient

b. Medical nursing of hospital patient recovery from surgery

- 1) Daily check and charting of patients physical condition
- 2) Stitch removal
- 3) Directions to owner

8. Clinical laboratory techniques
   - a. Lab Testing - a 2 year technician specialty and a means for hospitals to give "in depth" service to clients
   - b. Kinds of laboratory tests most frequently requested
   - c. Ethics and importance of doing quality work in laboratory testing
9. Discharging hospital patients
   - a. Exam and last minute grooming of animal before owner is encountered
   - b. Follow up instructions
   - c. Fee collection
   - d. Encouraging return visits

V. HUMAN RELATIONS (AND THE SUPERVISOR)

Units of Instruction

1. The management process
   - a. Planning
   - b. Organizing
   - c. Directing (actuating)
   - d. Controlling
2. Decision making
3. Organization requirements

4. Decision tips
5. Delegation of responsibility
6. Why people work - Maslow's Heirarchy of Needs
7. Perception
8. Morale
    a. Theory X
    b. Theory Y
9. Morale indicators
10. Leadership
11. Power styles
    a. Autocratic
    b. Participation
    c. Free-rein
12. Communication
13. Cautions in communication
14. Deadly demotivators

VI. PRINCIPLES OF SMALL ANIMAL RESTRAINT AND RELATED TECHNIQUES

Units of Instruction

1. Canine restraint
    a. Carrying dog
    b. Nose tie
    c. Examination restraint
        1) General
        2) For injections
            a) I.M., S.Q.
            b) I.V.

3) Lateral recumbency
4) Hammerlock
5) Ears, eyes using rami of mandible and bridge of nose

d. Pilling dog
e. Giving liquids
f. Mouth (canine) speculum ror dental work
g. Leg ties for surgery
h. Retrieving "nasty" or unwilling dog from cage

2. Feline restraint
   a. Cloth over cat
   b. Holding cat
   c. Injections
      1) S.Q., I.M.
      2) I.V.
   d. Use of cat bag
   e. Pilling
   f. Retrieving cat from cage - cloth over animal
3. Bandaging
   a. General
   b. Johnson's elasticon
   c. Johnson's kling
4. Splinting
   a. Simple
   b. Thomas
5. Forced feeding
   a. Cat - nose or mouth
   b. Dog - wooden spool and stomach tube

REFERENCES

American Telephone and Telegraph Company. Win More Friends by Telephone.

American Veterinary Medical Association. Principles of Veterinary Medical Ethics

Catcott, Earl J. Canine Medicine.

Collins, W. E. Experience With Animal Technicians in Veterinary Practice.

Histacount Corporation. Histacount Key Master Bookkeeping System-Veterinarian's Edition.

Jones, L. Meyer. Veterinary Pharmacology and Therapeutics.

Leahy, John. Restraint of Animals.

Modern Veterinary Practice. Animal Health Technologist.

N.Y.S. Department of Health. Administrative Rules and Regulations on Depressant and Stimulant Drug Control.

N.Y.S. Department of Health. Article 33-A Public Health Law.

N.Y.S. Veterinary Medical Society. An Act to Amend the Education Law Relative to Certification of Animal Technicians.

Pfizer, Charles & Company. Modern Concepts of Veterinary Client Service.

Veterinary Economics. The Veterinary Business Magazine.

INSTRUCTIONAL MEDIA

American Animal Hospital Association, Film Library,
3920 E. Jackson Boulevard, Elkhart, Indiana.

Preparation for Aseptic Surgery 16 mm., 45 min., sound, black and white.

Outlines and demonstrates in detail the steps necessary, on both the part of the surgical technician and the veterinary surgeon, for preparing sterile instruments, packs, animal patient, operating room, and the operator in order to perform surgery in the animal hospital under aseptic conditions.

Association Films, Inc., Schering Professional Film Library,
Broad at Elm, Ridgefield, New Jersey 07657

Consultant to Twenty Million 16 mm., 13 min., sound, color.

Traces historical evolution of pharmacy operation and outlines the responsibilities of the modern pharmacist. Emphasizes pharmacist's need for product knowledge as it relates to good customer relations.

Prescription Writing in Modern Dentistry 16 mm., 25 min., sound, color.

Presents the philosophy and mechanics of prescription writing. Handling of narcotic prescriptions and the importance of history taking and proper diagnosis are emphasized.

Eli Lilly and Company, Audio Visual Film Library, P. O. Box 618,
Indianapolis, Indiana 46206

Bridge to Tomorrow. 16 mm., 26 min., color, sound.

A story about the need for new drugs and the exhaustive procedures taken to insure their safety. The film shows the extensive research and testing done on new drugs their release for use.

Models of Organization and Communication Objectives.

16 mm., sound, black and white.

Describes proper organization and outlines objectives to be met for better communications within a company set-up. Originally a T.V. tape presentation at the American Animal Hospital Association Meeting in Denver, Colorado in April 1970.

What it Takes is Time 16 mm., 20 min., color, sound.

Treats the problem involved with farmers and veterinarians using antibiotics in meat animals, emphasizing the need for time for the drug to be cleared from the body before the animals can be shipped to market.

Your Client Wants to Know 16 mm., 20 min., sound, color.

Focuses on the use of visual aids to help educate clients coming to a busy veterinary hospital. Emphasizes the pet owner's desire to know what is wrong with her pet, how the problem will be treated and why the treatment involves reasonable expense.

New York State Colleges of Agriculture and Home Economics, Film Library Section, Cornell University, Ithaca, New York 14850.

Friend of a Friend. 16 mm., 15 min., sound, black and white.

Describes a typical day in the operation of a veterinary hospital. Emphasizes the importance of a basic health plan for dogs and shows the advancements made in the treatment of disease.

New York Telephone Company, Film Library, 1750 Genesee Street,
Utica, New York 13502

A Manner of Speaking 16 mm., 28 min., sound, color

A humorous story depicting misuse of the telephone in an advertising business firm and how it shatters office harmony and irritates a very important client. The film points out practical ways to achieve telephone courtesy and illustrates many of the good things which you can derive from using common sense telephone manners during working hours.

For Immediate Action 16 mm., 18 min., sound, color.

This film emphasizes the importance of prompt answering of the telephone, placing calls by numbers, staying on the line until the called party answers as a few of the effective measures that can be used by those answering professional service telephones in the interest of good business. It causes the viewer to consider the kind of impressions they may be creating with clients who call the office.

The Voice of Your Business. 16 mm., 12 1/2 min., sound, color.

An animated film depicting how "Mr. Short" learns from his successful competitor across the hall how proper use of the telephone helps build a business.

State University of New York at Delhi, Audio-Visual Department
Delhi, New York 13753

Preparation for Aseptic Surgery. 1 inch Ampex Video Tape, 30 min., black and white.

Describes instruments and drugs needed and procedures for setting up for aseptic surgery, including preparation of the animal patient and the operator.

Small Animal Restraint. 1 inch Ampex Video Tape, 20 min., black and white.

Demonstrates some of the commonly used methods of restraint used on dogs and cats for various medical procedures which do not require the use of general anesthesia.

Sterling Movies, Inc., 43 West 61st Street, New York, N.Y. 10023.

Medicine Man. 16 mm., 27 min., sound, black and white.

A critical look at quackery as it is practiced today through the promotion of dubious "miracle" drugs and glib charlatans who feed upon the publics hopes and fears by promising medical cure-alls.

I Am A Doctor. 16 mm., 30 min., sound, color.

Focuses attention on the character, qualifications, educational standards and clinical preparation for a career in medicine.

MAMMALIAN PHYSIOLOGY

HOURS REQUIRED

Class, 3: Laboratory, 3.

DESCRIPTION

A study of the function of cells, tissues, organs and systems involved in mammalian organisms primarily utilized in laboratory animal situations and those animals most commonly involved in a veterinary practice. Lecture periods follow a pattern of systems and deal with each bodily system with regard to the function and behavior of these anatomical structures.

Laboratory periods expand upon the concepts of physiology which are applied in clinical and research areas. Methods of instruction include demonstrations, student projects with animals, films and videotapes. Emphasis is not on theoretical physiology in the laboratory, rather on applied physiology that will enable the technician to be able to complement a veterinarian in practice or a research professional in a bio-medical institution. The number of students in each laboratory section is limited to 24 due to spatial seating arrangements and available instructors.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Introduction	2	0
II.	Cellular Physiology	5	1
III.	Nervous System	4	1
IV.	Muscular System	3	1
V.	Circulatory System	3	2
VI.	Respiratory System	3	1
VII.	Digestive System	4	1
VIII.	Urinary System	4	1
IX.	Reproductive and Endocrine Systems	5	0
X.	Special Senses (Eye and Ear)	0	1
XI.	Large Animal Physiology	0	1
	Total	33	11

I. INTRODUCTION

Units of Instruction

A. Definition of terms

B. Types of physiology

C. Functional relationships of body systems

D. Characteristics of living animals

II. CELLULAR PHYSIOLOGY

Units of Instruction

A. Body fluid compartments

B. Chemical composition of cellular protoplasm

C. Cellular water

D. Cellular proteins

E. Cellular lipids

F. Cellular carbohydrates
G. Physical form of cellular components
H. Cellular constituents
    1. Plasma membrane
    2. Osmosis and cellular fluid balance
    3. Active transport
    4. Pinocytosis
    5. Intercellular contact
    6. Golgi apparatus
    7. Endoplasmic reticulum
    8. Ribosomes
    9. Mitochondria
    10. Lysosomes
I. Mitosis
J. Meiosis
K. Cellular nucleus and components

Laboratory Projects

1. Brownian movement
    a) Microscopic observation of carbon suspension suspension with student charting movement of one particle
    b) Determination of cause of movement
    c) Explain relationship of particle size and and degree of movement
2. Dialysis
    a) Demonstration of principles involved in the ability for ionic and non-ionic particles to pass through a semi-permiable membrane.

- b) Student is to explain the results of this experiment

3. Diffusion
    - a) Student prepares a tube for each A colloidal and a non-colloidal solution in agar and measures distance of travel for each during the period of one week.
    - b) Plot curves of diffusion rates for each solution.
    - c) Explain differences in rates of diffusion
4. Solutions
    - a) Problem set for out of class solving

III. NERVOUS SYSTEM

Units of Instruction

A. Nerve impulse physiology
    1. Stimulus
    2. Membrane potential
    3. Convergence and difergence

B. Autonomic nervous system physiology
    1. Sympathetic and parasympathetic components
    2. Sympathetic reactions to stimuli
    3. Parasympathetic reactions to stimuli
    4. Chemical reactions in A.N.S.
    5. Visceral afferent nerves
    6. Pathology of A.N.S.

C. Central nervous system physiology
    1. Brain (cerebrum, cerebellum, medulla)
    2. Spinal cord

3. Pathology of C.N.S.

D. Anesthesia

1. General considerations
2. Local anesthesia
3. General anesthesia
4. Depression
5. Tranquilizers

Laboratory Projects

1. Reflexes in the human
    - a) Elicit the patellar reflex and trace the pathway through the nervous system diagrammatically
    - b) Elicit the palpebral and corneal reflexes and explain the principles involved in each
2. Spinal reflexes in the dog
    - a) Elicit the spinal flexor reflex, or toe pinch and describe actions.
    - b) Elicit the patellar or knee jerk reflex in the dog and describe actions
    - c) Elicit the extensor thrust reflex in the dog and describe actions
    - d) Elicit the scratch reflex and describe actions.
3. Attitudinal and postural reactions
    - a) Elicit the various tonic neck reflexes in the dog and describe the action of each

        - b) Elicit the various supporting reaction responses in the dog and describe each.
        - c) Elicit the righting reaction in the dog and describe reactions
        - d) Elicit the various placing reactions in the dog and describe each
        - e) Elicit the hopping reaction in the dog and record the action seen
    4. Perform the various neurological examinations previously done, on an animal with an abnormality in the nervous system
    5. Demonstration of strychnine poisoning in the rat, noting convulsions and responses which result from the lowering of spinal reflex thresholds and abolition of C.N.S. inhibitory factors. The student is questioned as to the desirability of strychnine as a euthanasia method.

IV. MUSCULAR SYSTEM

Units of Instruction

- A. General considerations
    1. Physiological role of muscle tissue
    2. Types of muscle tissue in body
- B. Smooth or involuntary muscle
    1. Locations of smooth muscle in the body
    2. Structure of smooth muscle
    3. Nervous innervation of smooth muscle
    4. Smooth muscle contraction
- C. Cardiac muscle
    1. Cardiac muscle contraction

    2. Cardiac hypertrophy
    3. Pacemaker tissue

D. Skeletal or voluntary muscle

    1. Function of skeletal muscle
    2. Development of skeletal muscle
    3. Anisotrophic and isotrophic bands
    4. Muscle tissue components - actomyosin
    5. Mechanics of contraction
    6. Chemistry of contraction
    7. Heat production by muscles
    8. Contraction stimulus
    9. Types of contraction
    10. Muscular exercise

Laboratory Projects

1. Smooth muscle properties
    a) Using an anesthetized laboratory animal An incision is made along the midline and intestines are observed and treated with pilocarpine applied to show increased intestinal motility with a parasympathomimetic drug
    b) Atropine is placed on the intestinal surface to note effects. All actions are recorded.
2. Physiograph demonstration
    a) Physiograph components and capabilities are discussed
    b) Skeletal muscle preparation is demonstrated on the physiograph

V. CIRCULATORY SYSTEM

Units of Instruction

- A. Cardiac cycle
    - 1. Contraction sequence
    - 2. Diastole
    - 3. Systole
- B. Heart sounds
    - 1. Normal sounds
    - 2. Murmurs
    - 3. Valvular stenosis
    - 4. Valvular insufficiency
- C. Heart beat control
    - 1. Impulse pathway
    - 2. Heart block
    - 3. Heart rate control
- D. Blood volume
- E. Blood pressure
- F. Blood flow
- G. Pulse
- H. Reflexes
    - 1. Marey's law
    - 2. Bainbridge reflex
    - 3. Carotid sinus
    - 4. Carotid body
- I. Shock
    - 1. Factors
    - 2. Hypovolemic shock
    - 3. Neurogenic shock

Laboratory Projects

1. Discussion of cardiac cycle, describing diastole, systole and heart sounds. Students then auscultate various larger animals (dog, cat, horse, etc.) with stethoscope and listen for various heart sounds.
2. Instructor injects drugs into animals (epinephrine, atropine, etc.) for purpose of changing the character of heart rate and heart sounds.
3. Demonstration of electrocardiogram on laboratory animals and on students, showing the different lead sequences and discussing the electrical interpretation of the waves.
4. Each student is to determine his own pulse and heart rate as well as the pulse and heart rate of all laboratory animals available. Explain pulse deficit and have students watch for this phenomenon

VI. RESPIRATORY SYSTEM

Units of Instruction

- A. External and internal respiration
- B. Gas transfer
- C. Inspiration
- D. Expiration
- E. Pressure relationships
- F. Gas Exchange
  1. pO_2 and pCO_2
  2. Hemoglobin
  3. Carbonic anhydrase

G. Respiration control

1. Expiratory center
2. Inspiratory center
3. Pneumotaxic center
4. Hering-Brewer reflexes
5. Carotid body
6. Aortic body

H. Anoxia

1. Stagnant
2. Anoxic
3. Anemic
4. Histotoxic

Laboratory Projects

1. Discussion of breathing types (eupnea, dyspnea, apnea, hyperpnea, etc.) and volumes of respiration (vital capacity, tidal volume, complimentary volume, dead space, etc.)
2. Determination of normal respiratory rates for various animals available
3. Demonstration of anesthetic effect on respiration on laboratory animal as well as the effects of a respiratory stimulant on an anesthetized animal. The physiograph will be utilized.

VII. DIGESTIVE SYSTEM

Units of Instruction

A. Physical digestive factors

1. Prehension and chewing
2. Salivary glands
3. Swallowing

4. Gastric activity
5. Ruminent gastric movements
6. The omasum
7. The abomasum
8. The small intestine
9. The large intestine

B. Food absorption and digestive enzymes
    1. Absorption
    2. Amino acids and simple sugars
    3. Fats
    4. Absorption mechanisms
    5. Digestive enzymes
    6. Stomach glands
        a) Cardiac glands
        b) Fundic glands
        c) Pyloric glands
    7. Gastric juice
        a) Pepsin
        b) Rennin
        c) Lipase
        d) Hydrochloric acid
    8. Pancreatic gland juice
        a) Trypsin
        b) Chymotrypsin
        c) Trypsinogen
        d) Carboxypeptidase
        e) Enterokinase
    9. Intestinal enzymes
        a) Maltase, sucrase and lactase

        - b) Peptidase
        - c) Polynucleotidase, nucleotidase and nucleosidase
    - 10. Bile
        - a) Gall bladder
        - b) Cholecystokinin
- C. Metabolism
    - 1. Food breakdown
    - 2. Carbohydrate metabolism
    - 3. Fatty acid metabolism
    - 4. Amino acid metabolism
    - 5. Glycogen, fat and protein synthesis
    - 6. Heat of metabolism
    - 7. Water soluble vitamins
        - a) Thiamine
        - b) Cobalamin
        - c) Biotin
        - d) Riboflavin
        - e) Niacin
        - f) Pyrodoxine
        - g) Folic acid
        - h) Pantothenic acid
        - i) Lipoic acid
        - j) Ascorbic acid
    - 8. Fat soluble vitamins
        - a) Vitamin A
        - b) Vitamin D
        - c) Vitamin E
        - d) Vitamin K

D. Liver

- 1. Bile
    - a) Function
    - b) Pigments
- 2. Carbohydrate metabolism
- 3. Hormonal function
- 4. Detoxification
- 5. Protein synthesis
- 6. Urea formation
- 7. Fat metabolism

E. Pancreas

- 1. Exocrine function
- 2. Endocrine function
    - a) Insulin
    - b) Diabetes mellitus
    - c) Glucagon

Laboratory projects

1. Rats will have been fed colored food at specific times prior to each laboratory section. These animals will be sacrificed and the digestive tract removed intact. The student is to measure the entire length of the digestive tract and the length of passage of dye from the ingested food.
2. The pH of stomach, small intestine, and large intestine is to be determined
3. The student is to diagram a cross section of stomach and label the different gland types found there from histological slides and texts

VIII. URINARY SYSTEM

Units of Instruction

A. General function of the kidney
   1. Introduction
   2. Renal factors
      a) Blood composition
      b) Arterial blood pressure
      c) Hormones
      d) Renal nerves
B. Primary renal functions
   1. Nephron unit
      a) Glomerulus
      b) Proximal convoluted tubule
      c) Distal convoluted tubule
      d) Collecting tubules
   2. Glomerular filtrate
      a) Effective filtration rate
      b) Juxtaglomerular apparatus
   3. Tubular Filtrate
      a) Tubular maximum
      b) Sodium reabsorption
      c) Acid-base balance
      d) Bicarbonate mechanism
      e) Acid phosphate mechanism
      f) Ammonia mechanism
   4. Urine pH
   5. Urine constitution
      a) color
      b) turbidity

- c) Specific gravity

5. Anti-diuretic hormone
    - a) posterior pituitary gland
    - b) Osoreceptors
    - c) Diabetes insipidus

C. Renal diseases

1. Pre-renal conditions
    - a) Congestive heart failure
    - b) Excessive blood loss
    - c) Traumatic shock
    - d) Dehydration
2. Renal diseases
    - a) Nephritis
    - b) Nephrosis
    - c) uremia
    - d) calculi

D. Kidney function tests

1. Renal clearance test
    - a) Creatinine
    - b) Inulin
    - c) Glomerular filtrate
2. Tubular maximum

Laboratory Projects

1. Gross examination of urine. Each student records color, specific gravity and turbidity of urine
2. Quick tests on urine. Each student performs each test
    - a) Clinitest (Ames)
    - b) Hema-combistix (Ames)

IX. REPRODUCTIVE AND ENDOCRINE SYSTEMS

Units of Instruction

- A. Oogenesis
- B. Ovulation
- C. Corpus luteum formation
- D. Estrous cycle
  - 1. Proestrus
  - 2. Estrus
  - 3. Metestrus
  - 4. Diestrus
  - 5. Anestrus
- E. Female reproductive hormones
  - 1. Estrogen
  - 2. Progesterone
- F. Spermatogenesis
- G. Spermatozoa transport
- H. Erection
- I. Ejaculation
- J. Male reproductive hormones
- K. Accessory sex glands
- L. Pituitary gland
  - 1. Anterior lobe hormones
    - a) Somatotropin
    - b) Adrenocorticotropin
    - c) Thyrotropin
    - d) Follicle-stimulating hormone
    - e) Leuteotropic hormone (prolactin)
    - f) Luteinizing hormone

2. Posterior lobe hormones
   a) Antidiuretic hormone (vasopressin)
   b) oxytocin

M. Adrenal Gland
   1. Cortex
      a) cortisone
   2. Medulla
      a) Epinephrine

N. Thyroid gland
   1. Thyroxine
   2. Basal metabolic rate

O. Parathyroid glands
   1. Calcium levels

P. Pancreas
   1. Insulin
   2. Glucagon

Q. Pineal body

R. Thymus gland

Laboratory projects

1. Films on reproduction and endocrinology are shown to class

X. SPECIAL SENSES

Units of Instruction

A. Eye
   1. Orbit
   2. Nictitating membrane
   3. Conjunctiva
      a) Palpebral
      b) Bulbar

4. Lacrimal duct
5. Tunica externa
    a) cornea
    b) sclera
    c) function
6. Tunica media
    a) Choroid
    b) Ciliary body
    c) Iris
    d) Function
7. Tunica interna
    a) Retina
    b) Focal spot
    c) Function
8. Anterior and posterior chambers
    a) Aqueous humour
9. Vitreous humour
10. Lens
11. Diseases of eye
    a) Glaucoma
    b) Cataracts
    c) Keratitis
    d) Iritis
    e) Conjunctivitis

B. Ear
1. External ear
    a) Auricle
    b) Pinna
    c) External auditory canal

        - d) Function
    2. Middle ear
        - a) Petrous temporal bone
        - b) Tympanic membrane
        - c) Eustachian tube
        - d) Malleus
        - e) Incus
        - f) Stapes
        - g) Function
    3. Inner ear
        - a) Bony labyrinth
        - b) Semicircular canals
        - c) Vestibule
        - d) Cochlea
        - e) Endolymph
        - f) Organ of corti
        - g) Cochlear branch of acoustic nerve
        - h) Function

Laboratory Project

1. Examine eyes and ears of laboratory animals and test functions

XI. LARGE ANIMAL PHYSIOLOGY

Units of Instruction

None

Laboratory Projects

1. Take respiratory, heart and pulse rates of horse and cow
2. Collect urine sample from horse and cow

3. Examine eyes and ears of horse and cow
4. Practice lifting legs of horse for examination purposes
5. Collect fecal samples from horse and cow
6. Ausculate cow for rumen contractions
7. Practice various methods of restraint for examination on horse and cow

TEXT AND REFERENCES

Botar, J. The Autonomic Nervous System.

Easton, D. M. Mechanisms of Body Functions.

Evans, D. R. and A. J. Robertson. Brain Psychology and Psychology.

Florey, E. General and Comparative Animal Physiology.

Frandson, R. D. Anatomy and Physiology.

Hoar, W. S. General and Comparative Physiology.

Olmstead, E. G. Mammalian Cell Water.

Prosser, C. L. and F. A. Brown, Comparative Animal Physiology.

Schmidt-Nielsen, K. Animal Physiology.

Selkurt, E. E. Physiology.

Statland, H. Fluids and Electrolytes in Practice.

INSTRUCTIONAL MEDIA

Cornet Instructional Films, Chicago, Illinois.

Human Body: Respiratory System 16 mm., 13 1/2 min., sound, black and white.

Describes organs of respiratory system and describes ventilation and physics of alveolar diffusion.

Human Body: Sense Organs. 16 mm., 18 1/2 min., sound, color.

Shows different types of sensory receptors and how they function by animation. photomicrographs, live action and anatomical drawings.

Eli Lilly, Indianapolis, Indiana

Kidney Function in Health. 16 mm., 38 min., sound, color

Animated film on normal renal physiology.

Encyclopedia Brittanica Films, Inc., Wilmette, Illinois

Digestion of Foods. 16 mm, 11 min., sound, black and white.

Explains processes of digestion in mouth, stomach and small intestine. Mechanical and chemical methods discussed.

Mechanisms of Breathing. 16 mm., 11 min., sound, black and white.

Animated film of respiratory physiology.

Work of the Blood. 16 mm., 12 min., sound, black and white.

Structure and composition of red cells shown by blood sample analysis. Uses animated drawings and radiographic motion photography.

APPLIED MICROBIOLOGY

HOURS REQUIRED

Class, 3; Laboratory, 2.

DESCRIPTION

An advanced course designed on a multiple application basis and intended to encompass the fields of dairy, food and pathogenic microbiology.

The dairy, food aspect, which represents the minor emphasis area of this course, is organized to acquaint students with the classes of bacteria which are most commonly involved and of importance in the processing and manufacture of foodstuffs and milk products. Lecture periods will be devoted to discussing the characteristics, reactions and involvement of selected organisms which may have beneficial effects or in some instances adverse effects on milk and food products. Laboratory sessions are designed to implement the development of basic techniques such as bacteriological quality control, fermentation and analytical methods and other procedures related to this technology.

The pathogenic microbiology section of this course represents the major emphasis area and is devoted to the development of a comprehensive understanding of the identification and pathological manifestations of organisms which show disease causing potential in man and animals. Lecture periods are programmed to include discussion relating to the etiology mechanisms of infection and pathogenesis of selected organisms; many of which exhibit zoonotic tendencies. The laboratory periods will be used to develop and to practice methods related to obtaining swab and tissue samples from various animal species and culturing, identifying and becoming familiar with the biological characteristics of the variety of organisms studied.

Laboratory sections in both aspects of this course are restricted to a total of 15-20 students in order that a maximum of individualized attention can be given to students as required. Due to the nature of this course it is necessary that participants complete laboratory exercises relating to culturing and isolation procedures at interim times (as required) additional to scheduled laboratory periods.

Formal written laboratory reports are required for each laboratory exercise completed.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Introduction to Dairy and Food Microbiology	2	The Laboratory Exercises are not designed to correlate with lectures.
II.	Beneficial and Contaminating Microorganisms	2	
III.	Factors Influencing Dairy and Food Processing	1	
IV.	Factors that Effect The Growth and Metabolism of Dairy and Food Microorganisms	1	

V.	Quality Control Determination	2	Laboratory sessions are enumerated following lecture outline information.
VI.	Common Dairy and Food Pathogenic Microorganisms	2	
VII.	Sanitation Practices	1	
VIII.	Introduction to Pathogenic Microbiology .	2	
IX.	The Causes of Disease	2	
X.	The Protective Mechanisms of the Body	1	
XI.	Toxins and Antitoxins	1	
XII.	The Lytic Antibodies	1	
XIII.	Agglutinins, Precipitins, Phagocytosis .	1	
XIV.	Hypersensitization	1	
XV.	The Pathogenic Microorganisms	12	
XVI.	Sterilization and Sanitization Techniques	1	
	Totals	33	11

I. INTRODUCTION TO DAIRY AND FOOD MICROBIOLOGY

Units of Instruction

1. Historical Aspects of Dairy and Food Microbiology
2. Importance of microbiology to the Dairy and Food industries
3. Introduction to Federal and State Regulations

II. BENEFICIAL AND CONTAMINATING MICROORGANISMS

Units of Instruction

1. Organisms used in the manufacture of food products.
2. Organisms responsible for fermentation of silage
3. Organisms used for acid production in cultured dairy products

4. Flavor producing microorganisms
5. Proteolytic and non-acid tolerant bacteria
6. Coliform bacteria
7. The effects of yeasts and molds

III. FACTORS INFLUENCING DAIRY AND FOOD PROCESSING

Units of Instruction

1. Pasteurization temperatures for dairy products
2. Temperatures utilized in the preparation and processing of foods
3. Factors influencing temperature treatment of food products
4. Factors dictating the need for variation of method in food processing

IV. FACTORS THAT EFFECT THE GROWTH AND METABOLISM OF DAIRY AND FOOD MICROORGANISMS

Units of Instruction

1. Temperature
2. Moisture
3. Acidity or alkalinity
4. Aerobic or anaerobic environment
5. Storage
6. Viscosity of the product

V. QUALITY CONTROL DETERMINATIONS

Units of Instruction

1. Sample procurement methods
2. Sample processing
    a) Dilution techniques
    b) Selection and preparation of media

    - c) Inoculation and incubation of samples
    - d) Reading and interpretation of plates

3. Millipore Membrane Filter Method
    - a) operational usage
    - b) Testing of milk, water and foods
    - c) Evaluation of results

4. Preparation of Smears
    - a) Stains recommended
    - b) Slide preparation and staining techniques
    - c) Examination of slides
    - d) Methods of identification

5. Other Quality Control Procedures and Tests
    - a) Coliform test
    - b) Thermoduric test
    - c) Thermophilic test
    - d) Psychrophilic test
    - e) Sterility test
    - f) pH test

VI. COMMON DAIRY AND FOOD PATHOGENIC MICROORGANISMS

Units of Instruction

1. Salmonella contaminations
2. Staphlococcal organisms
3. Streptococcal organisms
4. Spore forming contaminants (aerobic)
5. Spore forming contaminants (anaerobic)
6. Infective organisms in poultry products
7. Contaminants in salads and cream fillings

8. Contaminating organisms usually found in eggs, seafood, shellfish, frozen foods and processed milk products.

VII. SANITARY PRACTICES

Units of Instruction

1. Routine physical examination of employees
2. Sanitization of equipment and utensils
3. Recommended cooking temperatures
4. Recommendations for refrigeration of foodstuffs
5. Dishwashing procedures
6. Educational programs for food handling personnel

VIII. INTRODUCTION TO PATHOGENIC MICROBIOLOGY

Units of Instruction

1. Pathogenic microorganisms
2. The process of pathogenicity
3. Disease causing potential
4. Economic importance of pathogenic organisms relative to men and animals

IX. THE CAUSES OF DISEASE

Units of Instruction

1. The fates of infecting organisms
2. Sources of infection
3. Infection and contagion
4. Properties of pathogenic organisms
5. The mechanism of disease production

X. THE PROTECTIVE MECHANISMS OF THE BODY

Units of Instruction

1. The primary defenses

2. The secondary or parenteral defenses
3. Behavior of fluids and tissues toward foreign particles
4. Behavior of animals toward immunizing agents
5. Types of Immunity
6. Effects of nutrition and environment on disease
7. Antigens and antibodies

XI. TOXINS AND ANTITOXINS

Units of Instruction

1. Toxin Units
2. Antitoxin units
3. Production and standardization of antitoxin
4. Toxoids for immunization

XII. THE LYTIC ANTIBODIES

Units of Instruction

1. The lysins
2. The complement - fixation test
3. Applications of the compliment-fixation test

XIII. AGGLUTININS, PRECIPITINS AND PHAGOCYTOSIS

Units of Instruction

1. Application of agglutination test
2. Application of precipitin test
3. The oposonic index

XIV. HYPERSENSITIZATION

Units of Instruction

1. Anaphylaxis
2. Serum sickness
3. Allergy

4. Relationship of allergy to immunity

XV. THE PATHOGENIC MICROORGANISMS

Units of Instruction

1. The Streptococci
    a) General characteristics
    b) Differentiation of the streptococci
    c) The hemolytic streptococci
    d) The non hemolytic streptococci of animals
    e) Immunity to streptococcal organisms
    f) Chemotherapy of streptococcal infections
2. The Staphylococci
    a) Staphlococcus aureus
    b) Staphlococcus albus
    c) Characteristics of staphlococcal infections
3. The Pyogenic Bacteria
    a) Pseudomonas aeruginosa
    b) Corynebacterium pyogenes
    c) Corynebacterium renale
    d) Corynebacterium pseudotuberculosis
4. The Enteric Pathogens
    a) Escherichia coli
    b) Salmonella
    c) Shigella
5. The Pasteurella Group
    a) The hemorrhagic septicemia organisms
    b) Pasteurella multocida
    c) Pasteurella pestis
    d) Pasteurella tularensis

6. The Brucella Group
    a) Brucella abortus
    b) Brucella suis
    c) Brucella melitensis
    d) Brucella bronchiseptica
7. The Acid Fast Organisms
    a) Mycobacterium tuberculosis
    b) Types of tubercle bacilli
    c) Saprophytic acid - fast bacilli
8. The Pathogenic Sporeforming Anaerobic Bacteria
    a) Clostridium tetani
    b) Clostridium botulinum
    c) Clostridium chauvei
    d) Clostridium septicum
9. The Spirochetes
    a) The genus Treponema
    b) The genus Leptospira
10. The Viruses
    a) Biologic nature of viruses
    b) Properties of viruses
    c) Artificial cultivation
    d) Specificity of viruses
    e) Immunity in virus diseases

XVI. STERILIZATION AND SANITIZATION TECHNIQUES

Units of Instruction

1. Sterilization
2. Sanitization
3. Methods of sterilization

    - a) Chemical
    - b) Gas
    - c) Steam
    - d) Other
4. Methods of Sanitization
    - a) Chemical
    - b) Ultra Violet
    - c) Hot water
    - d) Detergents

LABORATORY EXERCISES

EXERCISE I PUBLIC HEALTH AND MILK MICROBIOLOGY

PART A

1. Preparation of swab sample tubes and media
2. Swab samples taken of glassware and dishes in college cafeteria
3. Incubation plates and reading of results
4. Preparation and microscopic examination of slides
5. Identification of contaminating organisms

PART B

1. Collection of milk samples (obtain from local farms)
2. Incubation and preparation of slides; examine microscopically
3. Identification of contaminating organisms

EXERCISE II MICROBIOLOGY OF DAIRY AND FOOD PRODUCTS

1. Preparation of general and selective media
2. Procurement of dairy products and frozen and dehydrated food products from local grocery store
3. Processing of samples

4. Inoculation and incubation of samples
5. Preparation and microscopic examination of slides
6. Identification of organisms using prescribed determinative methods

EXERCISE III MILLIPORE MEMBRANE FILTER SAMPLING METHODS

1. Introduction to Millipore apparatus and operation
2. Procurement and filtering of water and milk samples from multiple sources
3. Collection of air samples using Millipore apparatus
4. Inoculation of media with water, milk and air samples
5. Incubation and identification of organisms obtained from sample plates.

EXERCISE IV MICROSCOPIC IDENTIFICATION OF SELECTED GROUPS OF PATHOGENIC MICROORGANISMS

1. Prepare slides for microscopic examination from suspensions of chemically inactivated pathogenic microorganisms
2. Supplement microbial suspension slides with prepared, stained slides representing additional pathogenic species
3. Microscopically observe and examine slides, representing a total of twenty five different species of pathogens
4. Specify characteristics of each species as follows:
    a) Identity of the organism
    b) Classification (bacteria, fungi, protozoa)
    c) Resistance classification (vegetative, capsule former, spore former, cyst)

d) Form of occurrence (cocci - rods and others)

e) Slide grouping - (single, chains, diplo clumps, tropozoites)

f) Disease etiology

g) Prepare a drawing depicting the form and shape of each species of organism

EXERCISE V HEMATOLOGY AND CYTOLOGY EXERCISE

This exercise is designed to show the behavior of fluids and tissues of normal animals toward foreign particles

1. Inject normal rabbits with a heavy suspension of Escherichia coli intravenously
2. Anesthetize rabbits and remove blood samples by heart puncture every five minutes for a half hour after the bacterial injection
3. Each interval blood sample is serially diluted from 1:10 to 1:100,000 and streaked for isolation on blood agar plates
4. After completion of blood sampling euthanized rabbit tissue samples recovered; (lung, liver, spleen, kidney and muscle) and ground in a tissue grinder, thereafter individually serially diluted 1:10 to 1:100,000 with sterile physiological saline and inoculated onto agar plates
5. Infiltration of the Escherichia coli suspension into the body fluids and tissues of the rabbit and the corresponding fluid - tissue response of the animal, are evaluated by determination of plate count at the five serial dilution levels

EXERCISE VI MICROBIOLOGICAL QUALITY CONTROL OF LABORATORY ANIMALS

1. Select and euthanize a laboratory rodent (mouse, rat gerbil, hamster or guinea pig.)
2. Using demonstrated aseptic necropsy technic remove body fluid, fecal and tissue samples for microbiological determination of intestinal, respiratory and systemic pathogens
3. Inoculate samples on recommended media and incubate.
4. Using selective media and determinative techniques isolate and identify pathogenic or presumptively pathogenic organisms present in each of the samples.

EXERCISE VII THE STAPHLOCOCCI

1. Inoculate a mixed culture containing Staphlococcus aureus, albus and citreus onto blood agar plates
2. Incubate and describe morphological characteristics of colonies
3. Using determinative techniques identify and prepare isolates of each of the three species of staphlococcal organisms.
4. Compare macroscopically the colony morphology of each.
5. Check each isolate for hemolytic reaction
6. Prepare gram stains from each isolate sample. Observe and compare microscopically the shape, size and cell groupings of the organism
7. Inoculate isolate samples onto nutrient agar and into broth media. After incubation, compare colony morphology and microscopic appearance with those

inoculated initially on blood agar.

EXERCISE VIII THE STREPTOCOCCI

1. Inoculate blood agar plates with throat swab samples supplied by students, throat swab and fecal samples obtained from laboratory animals and raw milk samples obtained from a local farm. Also inoculate control plates from a pure culture of Streptococcus pyogenes
2. Incubate all samples and examine plates for appearance of streptococcal growth
3. Compare colony growth from incubated samples with that of control plate.
4. Check samples for appearance and type of hemolytic reaction
5. Prepare slides for microscopic examination of samples which are presumptively positive and also from the positive control plate
6. Examine microscopically for cell types, size, gross appearance and cell groupings. Compare with positive control
7. A common saprophyte, Sarcina lutea, frequently contaminates cultures of true streptococcal pathogens. It can be easily recognized by its deep yellow pigment and microscopic appearance.
    a) Inoculate from pure culture onto blood agar, incubate and examine both macroscopically and microscopically, a sample of this organism, Sarcina lutea.

EXERCISE IX SALMONELLA - SHIGELLA GROUP

1. Inoculate and incubate fecal samples obtained from human and/or animal (laboratory or domestic), sources onto enrichment broth. Also inoculate a positive Salmonella and a positive Shigella positive control and incubate.
2. Transfer, after incubation to selective media (plates and slants)
3. Observe all plate and slant growth and biochemical reactions from human and animal samples and compare with positive controls
4. Retain all presumptive positives
5. Complete slide or tube agglutinations as follows
    a) Salmonella - complete polyvalent agglutination test on all presumptives and group agglutinations on samples positive in polyvalent test
    b) Shigella - complete grouping sera agglutination tests
6. In all agglutination tests compare sample results with positive controls
7. Prepare gram stains of positive Salmonella and Shigella positive controls and from positive samples
8. Examine and compare microscopically

EXERCISE X

1. Field Trip to regional public health laboratory for purposes of familiarization with operations of a state health facility. Specific emphasis is elaborated in the area of rabies diagnosis using fluorescent antibody technique

2. Indoctrination and demonstration relating to rabies diagnosis procedures included:
    a) Explanation of the florescent antibody technique
    b) Operation of F A microscope
    c) Treatment and processing of brain material
    d) Staining of brain microscopic slides
    e) Reading and interpretation of slides
3. Each student examines and compares positive and negative rabies slides microscopically under the F A microscope

EXERCISE XI CORYNEBACTERIA - KLEBSIELLA GROUPS

1. Obtain animal sample materials from local farms or from available laboratory species
2. Inoculate Corynebacteria samples onto recommended media and incubate. Follow up with determinative techniques for positive identification of presumptives. Compare results with positive control.
3. Inoculate Klebsiella samples onto recommended media and duplicate instructions given for Corynebacteria in #2
4. Prepare gram stains from samples for microscopic examination. Compare shape, size and grouping of each slide with positive controls slides from both organisms

TEXT AND REFERENCES

One of the following may be selected as a textbook. The others may be selected as references.

American Public Health Association. Standard Methods

Breed, R.S., E.C. Murray and N.R. Smith. Bergey's Manual of Determinative Bacteriology.

Dykstra. Animal Sanitation and Disease Control

Hagan, W. A. and D.W. Bruner. The Infectious Diseases of Domestic Animals.

Merchant. Veterinary Bacteriology and Virology

Olsen. Quality Control of Market Milk

Smith. Veterinary Pathology

Spled. The Problems of Laboratory Animal Disease

Tanner. The Microbiology of Foods

Weiser. Practical Food Microbiology and Technology

INSTRUCTIONAL MEDIA

Coronet Instructional Films, 65 South Water Street, Chicago,
Illinois 60601

Infectious Diseases and Man Made Defenses. 16 mm., 11 min., sound, color.

This film shows some of the causes of infectious diseases and explains the use of man made defenses such as antitoxins, vaccines and antibiotics to protect ourselves against the disease process.

Infectious Diseases and Natural Body Defenses. 16 mm., 11 min., sound, color.

Describes the two categories of natural defenses used by the body to fight disease. Outer body defenses include the skin and passages of the nose and throat. Inner body defenses include lymph glands, antibodies and white blood cells.

Microorganisms that Cause Disease. 16 mm., 11 min., sound, color.

A comprehensive presentation of five classifications of pathogenic microorganisms including fungi, bacteria, viruses, rickettsiae and protozoa is provided. This film stresses the concept that pathogenic microorganisms cause infectious diseases through the destruction of cells.

Encyclopaedia Britannica Educational Corporation, 1822 Pickwick Avenue, Glenview, Illinois 60025.

Bacteria. 16 mm., 19 min., sound, color

Describes the basic characteristics of bacteria; their external and internal structures, manner of feeding and reproductory processes.

Eli Lilly Audio-Visual Film Library, Department M-497, Eli Lilly and Company, Indianapolis, Indiana. 46206.

Triad of Infection. 16 mm., 14 1/2 min., sound, color

This is an animated presentation depicting the interrelationships of host, bacteria and antibiotics by following the progression of events in hypothetical infection.

McGraw-Hill Book Company, Text-Film Division, 327 W. 41st Street, New York, New York. 10036

The Germ Theory of Disease. 16 mm., 28 min., sound, color.

Outlines the history of contagion in diseases. Explains host-parasite relationship and discusses Koch's Postulates.

Explains symptomology relating to disease causing organisms.

National Medical Audiovisual Center (Annex), Station K,
Atlanta, Georgia 30324

Chemical Disinfection. 16 mm., 30 min., sound, color

Describes chemical disinfection in hospital practice. Definitions relating to disinfection as well as factors involved and recommendations relating to disinfection are covered.

Epidemiology of Brucellosis. 35 mm. slides (86 frames), commentary (33 1/3 RPM record), color.

Explains the epidemiology of brucellosis in cattle, swine and goats and its transmission to man. Covers in each case method of infection, the course of the disease and the public health and economic implications.

Isolation and Identification of Beta Hemolytic Streptococci. 16 mm., 16 min., sound, color.

Shows methods of collecting throat specimens for culture and procedures for preparation of blood agar, inoculation of this media and identification of surface and deep colonies.

The Epidemiology of Salmonellosis In Man and Animals. 16 mm., 15 min., sound, color.

Shows the complex transmission patterns of salmonellosis - from contaminated feeds to food animals to humans. The significance of human "carriers" among food handlers, along suggested means of control is discussed.

The Infectious Diarrheas. 16 mm., 15 min., sound, color

Discusses the overall problems involved in the control of some enteric diseases.

Tuberculosis: Laboratory Aids To The Diagnosis and Treatment.

16 mm., 13 min., sound, color.

Briefly illustrates procedures available in the diagnosis and treatment of tuberculosis patients. Emphasizes rapid culture methods, direct drug susceptibility testing and the differentiation of unclassified mycobacteria.

INTRODUCTORY PSYCHOLOGY (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class 3.

DESCRIPTION

This course is designed to provide the student with a knowledge and appreciation of the basic principles of psychology as it relates to man in present day society.

Functional approaches pertaining to the study of behavior of man and other organisms will include considerations of background, biological bases of behavior, development, perception, motivation, learning, emotion, personality and adjustment.

It is also the intent of this course to involve the student in thought and discussion of theoretical issues, as well as the practical applications of psychology as it involves individuals and groups.

An understanding of the principles and concepts discussed, could assist the student functionally through improved interaction with our complex society.

Demonstrations, discussions, supplemental reading assignments and also papers on selected relevant topics are included to enhance the conceptual approach to this course.

MAJOR DIVISIONS

		Class Hours
I.	Introduction	5
II.	Biological Bases of Behavior	2
III.	Development	2
IV.	Personality	3
V.	Psychometrics	2
VI.	Perception	2
VII.	Motivation	2
VIII.	Learning	3
IX.	Emotion	2
X.	Adjustment	4
XI.	Mental Health	3
XII.	Social Psychology	3
	Total	33

I. INTRODUCTION

Units of Instruction

1. Objectives
    - a. To define and delimit the general field of psychology
    - b. To place psychology in the perspective of history, philosophy and social science
    - c. To correct some student misconceptions about psychology and behavior
    - d. To indicate the direction of the course towards:

1. The social science aspects of psychology as well as the natural science aspects
2. Free and open class discussion without penalty or shame.
3. The "shotgun" approach with speedily presented separate topics in text, outside sources, lectures and discussions (expecting some average loss in factual recall as the price).

2. Content
    a. Scientific methods applied to behavior
        1. Relevant characteristics of science
        2. Tools and techniques (live cases included)
    b. History of formal psychology and its roots
        1. Experimental physiology
        2. Philosophy
        3. The merger and its offspring
        4. Current status of American psychology

II. BIOLOGICAL BASES OF BEHAVIOR

Units of Instruction

1. Objectives
    a. To illustrate the extent to which behavior can be attributed to biological antecedents
    b. To emphasize the problems involved in model-making.
    c. To remove the biological stigma from some apparent behavioral differences.

d. To eliminate myths from student sex lore.

2. Content

a. The "cans" and "cannots" of genetics

b. The biological, individualistic side of the race question

c. The interaction between genes, nervous systems and endocrine glands.

d. Student-oriented sex questions and answers.

III. DEVELOPMENT

Units of Instruction *

1. Objectives

a. To extend the study of behavior from the uterus to death

b. To differentiate the developmental (historical-longitudinal, from the interactional (ahistorical-lateral) approach.

c. To provide practical and theoretical information about pregnancy, birth and child care for prospective parents.

d. To develop respect for the human at any stage of development from embryonic to old age.

2. Content

a. Abortion

b. Effects of pregnancy

c. Birth (trauma, post partem depression, etc.)

d. Physical stages

IV. PERSONALITY

Units of Instruction

1. Objectives
    - a. To present various, often conflicting, theories of personality, determination and development
    - b. To introduce psychoanalysis, the clinical method.
    - c. To correct some misconception about Freud.
2. Content
    - a. Descriptive approaches
    - b. Freud, neo-Freudians, other theorists
    - c. A psychoanalytic view of American culture.

V. PSYCHOMETRICS

Units of Instruction

1. Objectives
    - a. To describe psychometrics as far as possible without extensive technical skills in statistics required.
    - b. To discuss "intelligence" and its implication
    - c. To emphasize the value and limitations of quantitative rigor.
2. Contents
    - a. Descriptive and inferencial statistics (brief)
    - b. Tests and measurements

VI. PERCEPTION

Units of Instruction

1. Objectives

- a. To distinguish between the apparent and the real
- b. To demonstrate how perception can be manipulated
- c. To outline the complexity and irreplicability of animal sensory apparatus

2. Content
    - a. Physiology
    - b. Gestalt Principles
    - c. Implications (sublimimal, extra-sensory, etc)
    - d. Social perception

VII. MOTIVATION

Units of Instruction

1. Objectives
    - a. To apply a precise, psychological definition of motivation to all types of behavior
    - b. To increase the students' awareness of their personal motivations.
2. Content
    - a. Biological, psychological, extrinsic, ulterior, unconscious, hybrid
    - b. Technical applications to learning experiments.

VIII. LEARNING

Units of Instruction

1. Objectives
    - a. Same as Division #VII
    - b. To help students manage their own studying

2. Content
    - a. Classical and instrumental conditioning
    - b. Retention, extinction, relevant factors
    - c. Applications to laboratory, formal education

IX. EMOTION

Units of Instruction

1. Objectives
    - a. To attempt to label and describe this "loaded" material
    - b. To illustrate how emotions affect motivation, leaning, states of awareness, and health.
2. Content
    - a. Theories (James-Lange: Cannon-Bard; Arnold)
    - b. Word associations, lie detectors (Jung)
    - c. Psychosomatic disorders, employment, marriage (Adler)

X. ADJUSTMENT

Units of Instruction

1. Objectives
    - a. To describe "normal" reactions to frustrations; stress, etc.
    - b. To introduce more extreme reactions, cause and effects.
    - c. To relieve some student anxieties concerning their own idiocyncrasies, to identify others.
2. Content
    - a. Anxiety, aggression, withdrawal, compromise

b. Social, anti-social, asocial implication

c. Alcoholism, drug addiction, deviations, etc.

XI. MENTAL HEALTH

Units of Instruction

1. Objectives

   a. To outline the significant history and current status of the mental health movement

   b. To describe available resources for the student's reference

   c. To place mental health in perspective, contrast it with physical health, identify trends.

2. Content

   a. Survey - pathological vs. hygenic approach

   b. Techniques and schools

   c. Introduction to therapy (eclectic)

XII. SOCIAL PSYCHOLOGY

Units of Instruction

1. Objectives

   a. To study in detail the interactional approach, the individual in relation to his environment and others.

   b. To widen perspectives to include the group, cultural applications, values (Fromm)

2. Content

   a. The laboratory primary group - group therapy

   b. Field theory (Lewin)

   c. Social processes

TEXT

Hilgard, E. R. and R. C. Atkinson. Introduction to Psychology.

REFERENCES

Danial, R. S. Contemporary Reading In General Psychology.

McKinney, F. Psychology In Action.

Nunokawn, W. D. Human Values and Abnormal Behavior.

Perez, J., et. al. General Psychology.

Wrenn, R. L. Basic Contributions To Psychology.

ANIMAL SCIENCE TECHNOLOGY CURRICULUM

FOURTH TERM COURSE SCHEDULE

Anesthetic and Radiological Techniques . 211
Animal Parasitology 225
Laboratory Animal Science I 240
English Composition II 263
Health I (New York State Graduation Requirement)
Selected Animal Science Elective Courses

ANESTHETIC AND RADIOLOGICAL TECHNIQUES

HOURS REQUIRED

Class, 2: Laboratory 2

DESCRIPTION

An introduction to radiological techniques and anesthesia of animals involved in the practice of veterinary medicine and in bio-medical institutions. Each student will learn to position a patient, calculate exposure values, expose radiograph films and process radiographs of diagnostic value. Various anesthetic agents are demonstrated and the student learns to administer the most common barbiturate and inhalant anesthetics.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Introduction to Anesthesia	1)	1
II.	General Considerations	2)	
III.	Preanesthetic Drugs	2	1/2
IV.	General Anesthesia	4)	5
V.	Anesthesia Monitoring	2)	
VI.	Anesthetic Emergencies	2)	1
VII.	Introduction to Radiology	1)	
VIII.	X-ray Production	1)	1
IX.	Image Recording	1)	
X.	Exposure Factors	1	1
XI.	Film Storage and Handling	1	1/2

XII.	Film Processing	1)	1
XIII.	Safety Procedures	1)	
XIV.	Radiographic Technical Failure	2	0
	Total	22	11

I. INTRODUCTION TO ANESTHESIA

Units of Instruction

A. Definition of terms
   1. Anesthesia
   2. Analgesia
   3. Tranquilization
   4. Sedation
   5. Narcosis
   6. Hypnosis
   7. Local Anesthesia
   8. Regional Anesthesia
   9. Basal Anesthesia
   10. General and Surgical anesthesia

B. Reasons for administration of anesthesia
   1. Restraint
   2. Examination
   3. Manipulation
   4. Surgery
   5. Convulsion control
   6. Euthanasia

C. Types of anesthesia
   1. Inhalation
   2. Intravascular
   3. Topical, infiltration and conduction

4. Electronarcosis
5. Hypothermia

Laboratory Procedures

1. Orientation to surgery laboratory
2. Introduction to pharmacy, drug control and precautions.

II. GENERAL CONSIDERATIONS

Units of Instruction

A. Anesthetic factors
    1. Relative size
    2. Physical condition
    3. Age and sex
    4. Recent feedings and activity
    5. Preanesthetic medication
    6. Fear and excitement
    7. Concurrent diseases and drug administration
    8. Anesthetic agents and tolerance
    9. Available facilities
B. Physical examination
    1. Areas of examination
    2. Ancillary examinations
C. Selection of anesthetic agent
    1. Ideal anesthetic agent qualities
    2. Practical consideration for agents
    3. Precautions regarding anesthetic agents
D. Preparation of patient
    1. Feeding and water availability
    2. Antibiotic utilization
    3. Correction of anemic conditions

4. Preparation procedures

Laboratory Projects

1. Perform complete physical examination on canine and feline patients, including hematology, urinalysis and other ancillary examinations
2. Observe demonstrations of various agents and note the effects on each individual patient

III. PREANESTHETIC DRUGS

Units of Instruction

A. Uses of preanesthetic drugs

B. Types of preanesthetic drugs

1. Anticholinergics
2. Tranquilizers
3. Morphine and morphine substitutes
4. Miscellaneous agents

C. Discussion of specific drugs

D. Heroin, morphine and drug abuse

E. Lysergic acid diethylamide abuse

F. Cannibis abuse

Laboratory Projects

1. Injection of laboratory animals with various preanesthetic drugs in the laboratory with constant observation of each patient by the student.
2. Physiograph demonstration of various parameters utilized to monitor preanesthetic medication

IV. GENERAL ANESTHESIA

Units of Instruction

A. Stages of anesthesia

1. Analgesia
2. Delirium
3. Surgical anesthesia
4. Depression and death

B. Inhalation anesthesia

1. Introduction
2. Liquid inhalent anesthetic agents
3. Gaseous inhalent anesthetic agents
4. Methods of induction and maintenance
5. Halothane and Methoxyflurane

C. Respiratory physiology

1. Acid-base balance
2. Acidosis and alkalosis
3. Hypoxia types, symptoms and effects

D. Barbiturate anesthesia

1. Introduction
2. Classification of barbiturates
3. Therapeutic uses of barbiturates
4. Pentobarbital sodium
5. Thiopental sodium and thiamylal sodium
6. Routes of barbiturate anesthesia administration
7. Barbiturate slough

E. Miscellaneous anesthetic agents or methods

1. Chloral hydrate
2. Magnesium sulfate
3. Hypothermia
4. Electronarcosis
5. Neuroleptoanalgesia

Laboratory Projects

1. Weekly laboratory sessions involving patient preparation, barbiturate anesthesia, endotracheal intubation, inhalent anesthesia, surgical preparation and observation of induction and recovery involving the different anesthetic agents. This series of laboratory projects extends over a period of five weeks in order to give each student a sufficient degree of competence in the multifaceted areas of successful, safe anesthesia.

V. ANESTHESIA MONITORING

Units of Instruction

A. Respiratory Rate and quality

B. Pulse rate and quality

C. Heart rate and quality

D. Blood pressure

E. Temperature variations

F. Electroencephalogram

G. Practical veterinary anesthesia monitoring

Laboratory Projects

1. Clinical monitoring of anesthesia is conducted in laboratory
2. Further practical experience in this area continues in the Surgical Assisting Course
3. Demonstration of specialized equipment used under non-routine surgical anesthetic conditions

VI. ANESTHETIC EMERGENCIES

Units of Instruction

- A. Blood and blood substitutes
- B. Vasopressors
  - 1. Epinephrine pharmacology
  - 2. Amphetamine pharmacology
  - 3. Amphetamine abuse
- C. Adrenocortical steroids
  - 1. Adrenocorticotropic hormone
  - 2. Steroid pharmacology and clinical usage
- D. Cardiac defibrillator
- E. Analeptic pharmacology
  - 1. Pentylenetetrazol
  - 2. Methetharimide
  - 3. Doropram
- F. Cardiac Resuscitation

Laboratory Projects

- 1. Demonstration of various drugs and methods utilized during anesthetic emergencies

VII. INTRODUCTION TO RADIOLOGY

Units of Instruction

- A. Radiograph concept in diagnostics
- B. X-Rays - physics of X-radiation
- C. Construction and operation of X-Ray tube
  - 1. Overall composition of tube
  - 2. Anode target
  - 3. Cathode function
  - 4. Focal spot effects
  - 5. Heat dissipation in unit

    6. Kilovoltage
    7. Milliamperage

Laboratory Projects

    1. Demonstration of Picker 200 MA Stationary X-ray unit
    2. Demonstration of Picker 15 MA portable X-ray unit

VIII. X-RAY PRODUCTION

Units of Instruction

- A. X-ray beam production
    - 1. Central ray concept
    - 2. Kilovoltage effect
- B. X-ray absorption
    - 1. Subject contrast
    - 2. X-ray wavelength
- C. Image factors
    - 1. Milliamperage and brightness
    - 2. Film - focal distance
    - 3. Kilovoltage and penetration
- D. Heel effect
- E. Image formation
    - 1. Shadow effect
    - 2. Radiation source
    - 3. Rules for accurate image formation
- F. Scatter radiation
    - 1. Effect on contrast
    - 2. Methods of reducing scattered radiation

Laboratory Projects

1. Demonstration of production of radiographs of diagnostic quality
2. Exhibit of radiographs of insufficient diagnostic quality and reasons for occurance

IX. IMAGE RECORDING

Units of Instruction

- A. Methods of recording image
    1. Photosensitive film
    2. Fluorescent screen
- B. Intensifying screens
    1. Use of screens
    2. Composition of screens
    3. Types of screens
    4. Screen - film contact
- C. X-Ray film
    1. Composition of film
    2. Mechanics of film
    3. Types of film

Laboratory Projects

1. Demonstration of various types of X-ray film
2. Demonstration of radiographic screens and various types utilized in veterinary radiology

X. EXPOSURE FACTORS

Units of Instruction

- A. Intensity and time
- B. Film sensitivity
- C. Density of radiograph
- D. Radiographic contrast

E. Standardization of exposure factors

F. Contrast media and its application

G. Detail

   1. Motion effects
   2. Subject contrast
   3. Definition

Laboratory Projects

   1. Students expose a series of eight radiographs and compare variations of exposure factors.
   2. Demonstration of contrast media methods.

XI. FILM STORAGE AND HANDLING

Units of Instruction

A. Storage of film

   1. Room requirements
   2. Precautions regarding film
   3. Dating systems of film

B. Handling sheet film

   1. Precautions utilized
   2. Film containers
   3. Procedures for loading film holders
   4. Loading processing hangers

Laboratory Projects

   1. Demonstration of film storage methods
   2. Student will load film processing hangers

XII. FILM PROCESSING

Units of Instruction

A. Film processing solutions

   1. Developer

   2. Fixer
   3. Water bath

B. Preparation of solutions
   1. General precautions
   2. Liquid chemicals
   3. Dry chemicals

Laboratory Projects
   1. Demonstration of X-ray processing laboratory
   2. Student develops, fixes and processes exposed radiographs throughout course.

XIII. SAFETY PROCEDURES

Units of Instruction

A. Introduction
   1. State laws on radiation

B. X-ray protection
   1. Tissue involvement
   2. Importance of exposure records
   3. Establishing good technique
   4. Decreasing scatter radiation
   5. Instruments used to record radiation
   6. Importance of technical competence

C. Electrical safeguards
   1. Dangers of electrical shock
   2. Shockproof equipment standards
   3. "One Hand Rule" application
   4. Portable veterinary equipment problems

Laboratory Projects

1. Demonstration of protective equipment used in radiology
2. Students will use all protective measures constantly throughout laboratory periods when working with radiographic equipment

XIV. RADIOGRAPHIC TECHNICAL FAILURE

Units of Instruction

- A. Introduction
- B. Dark or black radiographs
- C. Gray non-contrast radiographs
- D. Light or excessively white radiographs
- E. Dark spots on radiographs
- F. White or light spots on radiographs
- G. Streaks, fingerprints and miscellaneous problems

Laboratory Projects

1. Closed-circuit demonstration of various radiographs with technical faults shown the class
2. Mistakes in production of diagnostic quality radiographs are pointed out to laboratory groups as they are made.

TEXT AND REFERENCES

Any one of the following books may be selected as a textbook. Others may be used for reference.

Abbatt, J. D. Protection Against Radiation.

Cahoon, J. B. Formulating X-Ray Techniques.

Carlson, W. D. VeterinaryRadiology.

Catcott, E. J. Progress in Canine Practice - Part I, Modern Veterinary Reference Series.

Collins, V. J. Principles of Anesthesiology.

Fletcher, G. H. Textbook of Radiology.

Fuchs, A. W. Radiographic Exposure and Processing.

Eastman Kodak Company The Fundamentals of Radiology.

Hall, L. W. Wright's Veterinary Anesthesia and Analgesia.

Lumb, W. V. Small Animal Anesthesia.

Smith, R. H. Electrical Anesthesia.

Westhues, M. and R. Fritsch Animal Anesthesia - General Anesthesia.

Westhues, M. and R. Fritsch Animal Anesthesia - Local Anesthesia.

INSTRUCTIONAL MEDIA

Abbott Laboratories, Film Library, N. Chicago, Illinois

Fire and Explosion Hazards From Flammable Anesthetics.

16 mm., 30 min., sound, color.

Prevention of accidents due to flammable anesthetic agents.

Ayerst Laboratories, 685 Third Avenue, New York, New York.

Principles of Inhalation Anesthesia in Domestic Animals.

16 mm., 40 min., sound, color.

Describes anesthesia using gas anesthesia in both small and large animals.

UFA Films, RKO Building, New York, New York

Moving X-rays. 16 mm., 11 min., sound, black and white.

X-ray motion pictures showing various organs of body.

ANIMAL PARASITOLOGY

HOURS REQUIRED

Class, 2; Laboratory 2

DESCRIPTION

A basic but comprehensive study of the more important parasites of domestic, zoo and laboratory animals. Classes of parasites to be studied will include the Protozoa, the helminths and insects.

Lecture periods will be devoted to a practical discussion of the various parasites. For each particular parasite, the discussion will evolve around the following considerations; namely, phylogenetic classification, life cycles (when of practical importance), pathogenicity, transmission and control. Elaboration will be made on those parasites of public health or meat and food inspection significance. Emphasis will be placed on how domestic colonies, flocks and herds become parasitized, how parasitism affects growth, production, and reproduction and how the chain of transmission can be broken. Latest methods of prevention and control will be presented.

Laboratory periods will be utilized to demonstrate and give practice in methods used in isolation and identification of the more common parasites of importance in veterinary and laboratory animal medicine.

Films, film-strips, 2 x 2 Kodochrome slides, microscopic slides, and plastic mounts will supplement specimens taken from local animals for purpose of study and review in the laboratory.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. General Introductory Considerations of Parasites	3	The Laboratory Exercises are not designated to correlate with lectures. Laboratory sessions are enumerated following lecture outline information.
II. Protozoa	3	
III. Helminth Parasites	8	
IV. Arthropod Parasites	7	
V. Summary and Conclusions	1	
Totals	22	11

I. GENERAL INTRODUCTORY CONSIDERATIONS OF PARASITES

Units of Instruction

1. Definitions of parasitic terms
2. Life cycles (history)
3. Host specificity

4. Modes of infection orinfestation
5. Effects of parasitic life on the parasite
6. Effects of parasites on the host
7. Resistance or immunity of host
    a. Natural immunity
        1) Active
        2) Passive
            a) Naturally acquired
            b) Artificially acquired
            c) Antibody-antigen reactions
            d) Immunological diagnostic tests
            e) Self cure and protection
            f) Immunity to specific parasitic organisms
8. Definitive and intermediate hosts

II. PROTOZOA

Units of Instruction

1. General
2. Amoebas
3. Flagellates
    a. Classification
    b. Trichomonads
    c. Giardia
    d. Histomonads
    e. Balantidia
4. Hemoflagellates
5. Sporozoa

- a. Classification
- b. Plasmodium
- c. Babesiidae
- d. Toxoplasma
- e. Coccidia

6. Arthropod-borne organisms other than Protozoa
   - a. Rickettsia
   - b. Anaplasma
   - c. Hemobartonella
   - d. Bartonella
   - e. Spirochetes
   - f. Bacteria
   - g. Viruses

III. HELMINTH PARASITES

Units of Instruction

1. Phylum Platyhelminths (flatworms)
   - a. Class - Trematoda
   - b. Class - Cestoda
     - 1) Family - Taeniidae
       - a) Taenia solium
       - b) Taenia saginata
       - c) Taenia hydatigina
       - d) Taenia pisiformis
       - e) Taenia multiceps
       - f) Other taenia
       - g) Echinococcus
     - 2) Family Diphyllobothriidae

2. Phylum Nemathelminthes (roundworms)
    a. Class Nematoda
        1) Family Ascarididae
            a) Toxascaris
            b) Toxacara
            c) Ascariasis in dogs, cats and fur bearers.
        2) Family Oxyuridae
        3) Family Rhabditidae
3. Order Trichinelloidea
    a. Family Trichinellidae
        1) Genus Trichinella
        2) Genus Trichuris
4. Order Strongyloidea
    a. Family Strongylidae
        1) Strongylinae
        2) Trichoneminae
        3) Oesophagostominae
        4) Stephanurinae
    b. Family Ancylostomatidae
    c. Family Trichostrongylidae
    d. Family Metastrongylidae
5. Order Spiruroidea
6. Order Filaroidae
    a. Family Filariidae
        1) Genus Dirofilaria
    b. Class Acanthocephala

IV. ARTHROPOD PARASITES

Units of Instruction

1. General
2. Class Insecta
    - a. Order Diptera
        - 1) Suborder Orthorrhapha
            - a) Family Simuliiae
            - b) Family Psychodidae
            - c) Family Culicidae
            - d) Family Tabanidae
        - 2) Suborder Cyclorrhapha
            - a) Family Oestridae
                - (1) General classification
                - (2) Genus Gastrophilus
                - (3) Genus Oestrus
                - (4) Genus Hypoderma
    - b. Family Muscidae
        - 1) General
        - 2) Subfamily Muscinae
            - a) Genus Musca
                - (1) Musca domestica
                - (2) Musca autumnalis
                - (3) Siphoria irritans
            - b) Genus Luicillia, Colliphora, Chrysomia, Phormia and Cochlimyia
        - 3) Subfamily Calliphorinae
        - 4) Subfamily Stomaxinae
            - a) Stomaxys caleitrans

5) Subfamily Glossinniae
6) Appendix Pupipara
c. Order Anaplura
1) Suborder Mallaphaga
2) Suborder Siphunculata
d. Order Siphonopteria
3. Class Arachinida
a. Order Acaridae
1) Superfamily Ixodoidea
a) Family Argosidae
b) Family Ixodidae
2) Superfamily Sarcoptoidea
a) General
b) Family Sarcoptidae
(1) Genus Sarcoptes
(2) Genus Psoroptes
(3) Genus Chorioptes
(4) Genus Otodectes
3) Superfamily Demodicoidea
a) Family Demodicidae

V. SUMMARY AND CONCLUSIONS

Units of Instruction
1. Review - control
2. Review - immunity and resistance
3. Host parasite lists

LABORATORY EXERCISES

EXERCISE I INTRODUCTION TO PARASITOLOGICAL EXAMINATION AND DIAGNOSIS

1. General considerations and importance of diagnostic methods.
2. Collection of specimens
   - a External parasites
   - b Internal Parasites
3. Microscopic examination of feces (qualitative)
   - a. Direct fecal smear method
   - b. Flotation methods
     - 1) Sugar solution technique
     - 2) Sodium nitrate solution technique
     - 3) Zinc sulfate solution technique
   - c. Sedimentation method (for trematodes)
4. Quantitative microscopic examination of feces (for herbivores)
5. Identification of Pseudo parasites in fecal specimens
6. Identification of lung worm parasites from intestinal parasites from fecal examinations.
7. Shipping of parasitological specimens to reference of diagnostic laboratories

EXERCISE II IDENTIFICATION AND DIAGNOSIS OF PARASITES - PROTOZOA

1. Using 2 x 2 Kodachromes, microscopic slides of prepared specimens and Turtox keys, the following will be studied as examples of Protozoa.
   - a. Endoamoeba histolytica
   - b. Trichomonas fetus

LABORATORY EXERCISES

EXERCISE I INTRODUCTION TO PARASITOLOGICAL EXAMINATION AND DIAGNOSIS

1. General considerations and importance of diagnostic methods.
2. Collection of specimens
    a External parasites
    b Internal Parasites
3. Microscopic examination of feces (qualitative)
    a. Direct fecal smear method
    b. Flotation methods
        1) Sugar solution technique
        2) Sodium nitrate solution technique
        3) Zinc sulfate solution technique
    c. Sedimentation method (for trematodes)
4. Quantitative microscopic examination of feces (for herbivores)
5. Identification of Pseudo parasites in fecal specimens
6. Identification of lung worm parasites from intestinal parasites from fecal examinations.
7. Shipping of parasitological specimens to reference of diagnostic laboratories

EXERCISE II IDENTIFICATION AND DIAGNOSIS OF PARASITES - PROTOZOA

1. Using 2 x 2 Kodachromes, microscopic slides of prepared specimens and Turtox keys, the following will be studied as examples of Protozoa.
    a. Endoamoeba histolytica
    b. Trichomonas fetus

c. Anaplasma marginale

d. Several species of Coccidia

2. Practice of performing fecal flotation exams from dog and cat specimens

EXERCISE III IDENTIFICATION AND DIAGNOSIS OF PARASITES - Trematoda

1. Using 2 x 2 Kodachromes, prepared microscopic specimens and Turtox keys - the following will be studies as examples of Trematodes
    - a. Fasciola hepatica
    - b. Fascioloides magna
    - c. Dicrocoelium dendriticum
    - d. Schistosoma japonicum
2. Practice performing fecal sedimentation exams - for intestinal flukes - ruminant fecal samples
3. Perform fecal flotation exams on fresh specimens from dog, cat, ruminant.

EXERCISE IV IDENTIFICATION AND DIAGNOSIS OF PARASITES - CESTODA

1. Laboratory study (as outlined above) of:
    - a. Taenia pisiformis
    - b. Dipylidium caninum
    - c. Taenia hydatigina
    - d. Echinococcus granulosus
    - e. Taenia saginata
    - f. Taenia solium
    - g. Moniezia expansa
2. Continued practice of fecal flotation exams - dog, cat, pig, ruminant as in earlier laboratory periods

EXERCISE V IDENTIFICATION AND DIAGNOSIS OF PARASITES NEMATODES

1. Laboratory study (as outlined above) of:
   a. Toxocara species (dog and cat)
   b. Toxascaris species (dog)
   c. Ascaris lumbricoides
   d. Parascaris equorum
2. Demonstration - identification of Dirofilaria immitis larvae in canine blood
3. Practice performing fecal exams - dog, cat, pig, horse.

EXERCISE VI IDENTIFICATION AND DIAGNOSIS OF PARASITES _ NEMATODES (continued)

1. Laboratory study of:
   a. Hook worm (Ancylostoma) species - dog
   b. Ruminant stomach worm species - cattle, sheep
   c. Strongyloides species - cattle, horse
2. Motion picture film of internal parasites (human and dog tapeworms and roundworms)
3. Practice performing fecal exams - dog, cat, ruminants, horse.

EXERCISE VII IDENTIFICATION AND DIAGNOSIS OF PARASITES _ NEMATODES (continued)

1. Laboratory study of:
   a. Whipworm species - Trichuris - dog
   b. Pinworm species - Oxyuris - horse
   c. Trichinella species - pig
   d. Strongyle species - horse
   e. Lungworm species - ruminant, pig, cat

2. Practice performing fecal exams - dog, cat, ruminant, horse, pig.

EXERCISE VIII IDENTIFICATION AND DIAGNOSIS OF INTERNAL PARASITES OF LABORATORY ANIMALS

1. Laboratory study of:
    a. Roundworm species
    b. Tapeworm species
    c. Whipworm species
2. Motion picture film of internal parasites of ruminants (Merck and Co.) and Equines (Upjohn Co.)
3. Practice performing fecal exams - mice, rats, guinea pigs, hamsters, rabbits, primate species, etc.

EXERCISE IX IDENTIFICATION AND DIAGNOSIS OF PARASITES - ARTHROPODS

1. Laboratory study of:
    a. Insects
        1) Flies of public health significance
        2) "Blow" flies
        3) "Bot" flies
        4) Fleas - dog, cat, rat
        5) Lice - dog, human, pig
2. Film on importance of arthropod vectors in the transmission of diseases from animals to man.
3. Continued practice performing fecal exams - specimens from laboratory animals.

EXERCISE X IDENTIFICATION AND DIAGNOSIS OF PARASITES

ARTHROPODS (continued)

1. Arachnids
    a. Ticks of parasitic and zoonotic importance
    b. Mites - dog, cow, pig, sheep, lab animal, poultry.
2. Summary and review of internal and external parasites studied during the course.

EXERCISE XI IDENTIFICATION AND DIAGNOSIS OF PARASITES

1. Practical Examination
    a. Station to station identification of prepared gross and microscopic speciment
    b. Demonstration of ability to properly perform a fecal analysis and identification of "known" parasites present.

TEXTS AND REFERENCES

Information selected from a number of the following references will be more helpful than designation of any one singly as a text.

Benbrook, E. A. and M. W. Sloss. Veterinary Clinical Parasitology 3rd edition.

Brooks, Thomas J. Jr. Essentials of Medical Parasitology

Brown, Harold W. M.D. Basic Clinical Parasitology

Cameron, Thomas W. M. The Parasites of Domestic Animals.

Chandler, Asa C. and Clark P. Read. Introduction to Parasitology.

Cheng, Thomas C. Ph.D. The Biology of Animal Parasites.

Coffin, David L. V.M.D. Manual of Veterinary Clinical Pathology.

Eddy, Samuel and A. C. Hodson. Taxonomic Keys (To the Common Animals of the North Central States).

Habermann, Robert T and Fletcher P. Williams, Jr. The Identification and Control of Helminths in Laboratory Animals.

Macinnis, Austin J. and Marietta Voge. Experiments and Techniques in Parasitology.

Merck and Company, Inc. The Merck Veterinary Manual.

Olsen, Eilford O. Animal Parasites: Their Biology and Life Cycles.

Soulsby, E. J. L. Helminths, Arthropods and Protozoa of Domesticated Animals (Sixth Edition Monnigs Veterinary Helminthology and Entomology)

Whitlock, John H. Diagnosis of Veterinary Parasitisms.

INSTRUCTIONAL MEDIA

Alden Films (McGraw-Hill), 5113 - 16th Avenue, Brooklyn 4, New York.

Ancylostoma: Life History of Hookworms. 16 mm., 25 min., sound, color.

A detailed scientific study of Ancylostoma - birth, maturation and reproduction are detailed. Describes physiological effects of infections on man, methods of study and possible medical control.

American Medical Association, Motion Picture Library, 535 N. Dearborn Street, Chicago, Illinois 60610.

Ancylostoma Caninum In the Intestine of the Dog. 16 mm., 5 min., sound, black and white.

Depicts blood-sucking activities of the adult dog hookworms in copulation while the female still feeds. Emphasizes the blood loss to the host canine.

American Veterinary Medical Association, Film Library, 600 South Michigan Avenue, Chicago, Illinois 60605.

Bovine Parasitic Gastritis. 16 mm., 17 min., silent, color. Gives, in detail, the symptomatology and and pathology of acute parasitic gastritis. Briefly discusses factors contributing to the condition.

Psoroptic Sheep and Cattle Scabies. 16 mm., 12 min., sound, color.

Shows symptoms in cattle and sheep affected with psoroptic scabies, loss of wool and hair, evidence of itching and irritation, and demonstration of causative mites. Methods of treatment and principles of scabies - eradication and control are outlined.

Ticks and Tick-Borne Diseases. 16 mm., 19 min., sound, color. Outlines morphological characteristics and geographic distribution of ticks in the United States. Symptoms of Rocky Mountain Spotted Fever and Colorado Tick Fever in man are shown. Also protective procedures and control methods are mentioned.

Encyclopaedia Britannica Educational Corporation, Regional Office, 202 E-st 44th Street, New York 17, New York.

Parasitism (Parasitic Flat Worms) E.B.#2065. 16 mm., 16 min., sound, color.

Traces the development of parasitic flatworms including blood, liver and lung flukes and tapeworms. Defines predation, mutualism, internal and external parasitism, and illustrates each of these relationships.

Extension Media Center, Distribution, University of California,
Berkeley, California 94720.

The World Within. 16 mm., 27 min., sound, color.

Shows how parasitism is found among plants and animals, how parasites differ from other organisms, and how parasites follow a birth to death cycle. Points up the importance of sanitation in combatting the spread of parasitic disease.

National Medical Audio-Visual Center (Annex), Chamblee, Georgia
30005 (Attention: FilmDistribution)

Arthropods of Public Health Importance. Film strip (42 frames, 1 disc)912 in. 33 1/3 r.p.m.) 7 min., color.

Shows the outstanding identifying characteristics of several species of arthropods ofpublic health importance.

LABORATORY ANIMAL SCIENCE I

HOURS REQUIRED

Class, 3; Laboratory, 3.

DESCRIPTION

An introductory course in basic laboratory animal technology and small animal anesthesiology designed to develop a conceptual understanding of fundamental methods and procedures relating to animal research and breeding techniques being employed by pharmaceutical laboratories, medical research centers, biological research institutions and commercial laboratory animal breeding establishments.

Consideration is given to the design of vivarial facilities, along with equipment recommended to provide an optimal environment for animals being utilized for breeding or experimentation.

Public laws and regulatory requirements governing the maintenance and use of laboratory animals is discussed. Humane care and recommendations for proper caging, nutrition, husbandry practices, breeding requirements and sanitation programs are also elaborated. Additionally, consideration is given to techniques and methods of tranquilization, anesthesia and euthanasia.

The development of proficiencies relating to handling, restraint, breeding and experimental utilization of selected species are achieved and practiced in the laboratory aspect of the course.

The necessity for closely supervised instruction in the laboratory portion of this course dictates limiting the size of individual sections to approximately 10-12 students. Duplication or replication of each laboratory exercise might then be required, depending upon the total number of students in the course.

In addition to the regularly scheduled weekly laboratory exercises, students also participate throughout the entire term, in laboratory animal practice. In the completion of this exercise each student is assigned in both animal technician employee and supervisory capacities to maintain the animal vivarial facility on a continuing operational basis, thus duplicating a work experience situation.

The diverse nature and quantity of material presented in this course prevents, for the most part, the intimate correlation of lecture and laboratory on a week by week basis, of lecture information and laboratory exercises.

This course provides a background and represents a prerequisite to the advanced course in laboratory animal technology entitled Laboratory Animal Science II.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. Introduction to Laboratory Animal Technology	2	The Laboratory Exercises are not designed to correlate with lectures. Laboratory sessions are enumerated following lecture outline information.
II. Laboratory Animal Facilities And Equipment For Conventional Breeding and Research Facilities	3	
III. Barrier Systems Design and Specifications for Breeding and Research Facilities	3	
IV. Classification and Discussion of Laboratory Animals According to Microbiological Profile (Qualities)	2	
V. General Requirements Relating to Laboratory Animal Food (non-nutritional) and Cage Bedding Material	1	
VI. Basic Nutrition and Essential Components of Laboratory Animal Feed	2	
VII. General Information Relating to Disease and Parasite Control in Laboratory Animal Facilities	3	
VIII. Chemical Disinfectants	2	
IX. Breeding and Mating Systems	2	
X. Record Keeping in Breeding and Research Colonies	1	

XI.	General Uses of Laboratory Animals for Biological and Biomedical Research .	2	
XII.	Tranquilization and Anesthesia	4	
XIII.	Euthanasia	1	
XIV.	Fundamental Physiological and Breeding Information Relating Individually to Common Laboratory Species	5	
	Totals	33	11

I. INTRODUCTION TO LABORATORY ANIMAL TECHNOLOGY

Units of Instruction

1. Historical aspects and evolution of laboratory animal research technology
    - a. Early approaches (equipment and technology)
    - b. Present day (procedures and facilities)
    - c. Philosophical and ethical aspects of animal research
    - d. Justification and contributions of laboratory animal research
2. Legal requirements and regulatory standards relating to laboratory animal research
    - a. Laboratory Animal Welfare Act (P.L. 89-544)
    - b. Federal and state inspections of vivarial facilities
    - c. ILAR standards for breeding, care and maintenance of laboratory animals
    - d. Advisory organizations (AALAS)

II. LABORATORY ANIMAL FACILITIES AND EQUIPMENT FOR CONVENTIONAL BREEDING AND RESEARCH FACILITIES

Units of Instruction

1. Philosophy of laboratory animal housing and maintenance
2. Basic environmental requirements and recommendations relating to laboratory animal housing
3. Basic design and construction concepts
    a. Equipment and supplies traffic flow pattern (clean and dirty)
    b. Single species per room specification
    c. Fundamental designs and construction materials specifications
    d. Environmental systems specifications
        1) Air conditioning
        2) Ventilation
        3) Ultra filtration
        4) Humidification-dehumidification
        5) Heat exchanges
        6) Temperature control
4. Environmental requirements for ten common species of laboratory animals
    a. Recommended temperature, humidity and air changes per hour for each species (ILAR standards)
5. Caging, cage systems and ancillary equipment
    a. Basic requirements for effective caging
    b. Caging construction materials
    c. Types of caging and caging systems for various

animal species

        d. Cage size and space requirements for ten common laboratory species (ILAR standards)
        e. Caging accessories
            1) Cage lids
            2) Food hoppers
            3) Watering equipment and systems
            4) Ancillary items (various)
    6. Mechanical cage washing, sanitation and sterilization equipment
        a. Specifications for effective use
        b. Cage washers
            1) Tunnel-conveyor types
            2) Cabinet types
        c. Cage rack washers
        d. Bottle washers
        e. Autoclaves
            1) Various models (regular)
            2) High vacuum
            3) Gas (ethelene oxide) type

III. BARRIER SYSTEMS DESIGN AND SPECIFICATIONS FOR BREEDING AND RESEARCH FACILITIES

Units of Instruction

1. Philosophical considerations and justification for use
2. Maximum barrier (SPF)
    a. Maximum environmental systems
    b. Design requirements

- c. Gnotobiotic capability for populating an SPF facility
- d. Special treatment (sanitization-sterilization of supplies and equipment)
  - 1) Autoclave
  - 2) Steam chest
  - 3) Dip tank
- e. Operational requirements
- f. Personnel requirements
- g. Research and breeder usefulness, advantages and limitations of SPF animals
- h. Microbiological profile of SPF animals
- i. Continuous support program of microbiological quality control
- j. Other items of miscellaneous importance

IV. CLASSIFICATION AND DISCUSSION OF LABORATORY ANIMALS ACCORDIN TO MICROBIOLOGICAL PROFILE (QUALITIES)

Units of Instruction

1. Axenic (germfree)
2. Gnotobiotic
3. Gnotobiotic (customized intestinal flora)
4. Specific pathogen free (maximum barrier)
5. High grade conventional (medium barrier)
6. Conventional

V. GENERAL REQUIREMENTS RELATING TO LABORATORY ANIMAL FOOD (NON-NUTRITIONAL) AND CAGE BEDDING MATERIALS

Units of Instruction

1. Food
    a. Hormonal limits
    b. Additives
    c. Microbiological quality control
    d. Packing and shipping
    e. Storage
    f. Usage dates
2. Bedding
    a. Various types
    b. Methods of sanitizing and sterilizing
    c. Microbiological quality control
    d. Packing, shipping and storage

VI. BASIC NUTRITION AND ESSENTIAL COMPONENTS OF LABORATORY ANIMAL FEED

Units of Instruction

1. Method of manufacture and various issue sizes available
2. Essential components of diets
    a. Proteins
        1) Essential
        2) Non-essential
        3) Metabolic effects
    b. Carbohydrates
        1) Metabolic effects
    c. Fat
        1) Metabolic effects

- d. Essential mineral salts
- e. Vitamins
  - 1) Fat soluble
  - 2) Water soluble
- 3. Hypovitaminosis
- 4. Hypervitaminosis

VII. GENERAL INFORMATION RELATING TO DISEASE AND PARASITE CONTROL IN ANIMAL FACILITIES

Units of Instruction

- 1. Quarantine (housing - care and treatment)
  - a. Requirements for ten common species
- 2. Microbiological support (quality control measures)
- 3. Personnel requirements
- 4. Transport of animals
- 5. Animal colony control programs
- 6. Restrictions

VIII. CHEMICAL DISINFECTANTS

Units of Instruction

- 1. General usage
- 2. Sanitization - sterilization
- 3. Classes (examples) of chemical disinfectants
- 4. Effectiveness evaluation
  - a. Phenol coefficient
  - b. Use confirmation dilution test

IX. BREEDING AND MATING SYSTEMS (CHARACTERISTICS OF EACH TYPE)

Units of Instruction

- 1. Randombred

2. Inbred
3. Hybrid
4. Linebred
5. General information relating to each of the above listed genetic types
    a. Genetic profile, physical and physiological characteristics
    b. Advantages for experimental usage
    c. Methods for genetic initiation and maintenance of this type of colony
    d. Methods for verification of genetic identity

X. RECORD KEEPING IN BREEDING AND RESEARCH COLONIES

Units of Instruction

1. Animal Breeding Operations
    a. Operational efficiency
    b. Trace the origin and spread of disease
    c. Determine biological performance
        1) Tumor development
        2) Weight gain
        3) Susceptibilities and resistances
2. Research laboratories
    a. Animal procurement records
    b. Quarantine colony records
    c. Test data records
        1) Observations
        2) Experimental groups and dosages
        3) Mortality and necropsy records
        4) Histopathology

XI. GENERAL USES OF LABORATORY ANIMALS FOR BIOLOGICAL AND BIO-MEDICAL RESEARCH

Units of Instruction

1. Product quality control
2. Screening studies (drugs)(anti-carcinogenic compounds)
3. Efficacy testing
4. Toxicity studies
5. Assay tests
6. Surgical techniques
7. Basic research
8. Teaching

XII. TRANQUILIZATION AND ANESTHESIA IN LABORATORY ANIMALS

Units of Instruction

1. Tranquilizers
    a. Definition
    b. Use of tranquilizers
    c. General effects of tranquilizing drugs
    d. Activity of tranquilizers
    e. Action of tranquilizing drugs
        1) Autonomic suppressants
        2. Central relaxants
        3. Narcotics
    f. Toxicity of tranquilizers
    g. Chemical composition
    h. Contraindications of tranquilizing drugs
    i. Tranquilizers in preanesthetic medication
2. Anesthetics
    a. Definition

- b. Planes of anesthesia
- c. Reflexes
- d. Examples and action in general (injectable) anesthetics
    - 1) Long acting
    - 2) Short acting
- e. Inhalent anesthetics
- f. Examples and action of local anesthetics

3. Analeptics
    - a. Definition
    - b. Antigonist type
        - 1) Types used for barbiturates
        - 2) Types used for morphine
    - c. Stimulant type
4. Anticholenergics
5. Electro-anesthesia

XIII. EUTHANASIA

Units of Instruction

1. Definition and general information
2. Selection of method and material
    - a. According to species
    - b. According to circumstances
        - 1) Routine
        - 2) Experimental animals
3. Methods
    - a. Chemical
    - b. Gaseous
    - c. Mechanical

4. Methods of disposal after euthanasia

XIV. FUNDAMENTAL PHYSIOLOGICAL AND BREEDING INFORMATION RELATING INDIVIDUALLY TO COMMON LABORATORY SPECIES

Units of Instruction

1. Species for which information is included
    a. Mice
    b. Rats
    c. Gerbils
    d. Hamsters
    e. Guinea pigs
    f. Rabbits
    g. Cats
    h. Dogs
    i. Primates
    j. Japanese quail
2. Information (individually for each species) includes
    a. Basic breeding data
    b. General maintenance and care recommendations
    c. Nutritional requirements
    d. Physiological measurements
        1) Life span
        2) Cardio-vascular, respiratory
    e. Laboratory and experimental usage

LABORATORY EXERCISES

EXERCISE I INTRODUCTION TO THE VIVARIUM

1. Tour of facilities
2. Types of caging and ancillary equipment
3. Identification of animal species and strains
4. Cage washing and sanitation equipment
5. Types of laboratory animal bedding materials and animal food issue sizes
6. Types of laboratory animal restraint devices and identification equipment
7. Indoctrination relating to basic operational aspects of the vivarium

EXERCISE II STERILIZATION AND DISINFECTION

1. Methods of sanitization and sterilization
    a. Steam pressure (autoclave)
    b. Gas sterilization (ethelene oxide)
    c. Chemical disinfectants
2. Types and usage of chemical disinfectants
3. Methods of cleaning and sanitatizing and/or sterilizing animal cages, racks and other ancillary laboratory equipment
5. Personal hygiene in the animal laboratory

EXERCISE III INTRODUCTION TO ANIMAL LABORATORY METHODS AND INITIATION OF VIVARIAL PRACTICE PROJECTS

1. Initiation of semester length, rodent breeding project (each student has complete responsibility for one breeding cage; including maintenance, breeding,

record keeping plus the collection of food-water consumption and growth rate data)

2. Indoctrination to and initiation of laboratory animal practice program; a semester length project in which each student is scheduled to participate in vivarial practice and supervision
3. Basic animal breeding colony maintenance and care techniques
4. Instruction and practice in handling, restraint, sex determination and breeding methods.
5. Selected species
    a. Mice
    b. Rats

EXERCISE IV COMPLETION OF INSTRUCTION AND PRACTICE IN HANDLING RESTRAINT, SEX DETERMINATION AND BREEDING.

1. Selected species
    a. Gerbils
    b. Hamsters
    c. Guinea pigs
    d. Rabbits
    e. Cats
    f. Dogs
2. Methods of disease detection in the vivarium

EXERCISE V RODENT DISSECTION, ANATOMY REVIEW AND NECROPSY PROCEDURES

1. Anatomical review of injection sites
2. Review of general gross anatomy including viscera and lymphatics

3. Location and excising of endocrine glands - gland weight determination on analytical balance
4. Necropsy examination techniques
    a. Removal of samples for microbiological and/or histopathological examination

EXERCISE VI INTRODUCTION TO METHODS AND PRACTICE OF LABORATORY ANIMAL INJECTIONS

1. Indoctrination relating to identification, processing and use of various tupes and sizes of hypodermic needles and syringe equipment
2. Sterile techniques in removing fluids from sealed containers
3. Identification of common injection sites
4. Restraint and practice injections (IM, IV, SUBQ, IC, IP, ID, selectively in various laboratory species
    a. Mice
    b. Rats
    c. Gerbils
    d. Hamsters
    e. Guinea pigs
    f. Rabbits
    g. Cats
    h. Dogs

EXERCISE VII INTUBATION TECHNIQUES AND INTRODUCTION TO LABORATORY ANIMAL TRANQUILIZATION AND BLOOD SAMPLING

1. Intubation and forced feeding - medicating
    a. Mice
    b. Rats

    c. Gerbils
    d. Hamsters
2. Tranquilization techniques relating to above listed species
    a. Calculation of dosage
    b. Administration
    c. Observation of effects
3. Practice blood sampling techniques (above listed species)

EXERCISE VIII INTUBATION AND LABORATORY ANIMAL TRANQUILIZATION AND BLOOD SAMPLING TECHNIQUES

. Intubation and forced feeding - medicating
    a. Guinea pigs
    b. Rabbits
    c. Cats
    d. Dogs
2. Tranquilization techniques relating to above listed species
    a. Calculation of dosage
    b. Administration
    c. Observation of effects
3. Practice blood sampling techniques (above listed species)

EXERCISE IX INTRODUCTION TO SMALL ANIMAL ANESTHESIA

1. Preanesthetics
2. Injectable anesthetics
    a. Local
    b. General
3. Practice dosage calculation
4. Administration of injectable anesthetics

5. Identification of planes of anesthesia

6. Reflexes

7. Use of analeptics

8. Inhalent anesthesia

   a. Passage of endotracheal tube

   b. Anticholenergics

EXERCISE X PRACTICE OF MISCELLANEOUS LABORATORY TECHNIQUES

1. Practice tattooing (dogs) - identification procedure

2. Practice catherization (dogs)

3. Ectromelia (mousepox) vaccination procedure

4. Determination of estrus (cytological method)

5. Pregnancy testing (A-Z procedure)

EXERCISE XI RODENT SURGERY PROCEDURE

(completed by each student on an individual basis)

1. Orientation and indoctrination of methods

2. Surgical preparation (instruments-needles and sutures)

3. Surgical (preoperative) preparation of animal

4. Surgical procedure

   a. Incision

   b. Ligation and removal of organ

   c. Suturing

   d. Post operative care

REFERENCES

All of the following bibliography is to be considered as reference material for this course.

Animal Welfare Institute. Basic Care of Experimental Animals

Collins, G. (AALAS). Manual for Laboratory Animal Technicians

Conalty, M. L.. Husbandry of Laboratory Animals

Croft, Phyllis G.. An Introduction to the Anesthesia of Laboratory Animals

D'Amour, F. E.; Flood, F. R. and D. A. Belden, Jr.. Manual For Laboratory Work in Mammalian Physiology

Farris, E. J. The Care and Breeding of Laboratory Animals

Farris, E. J. and Griffith, J. Q., Jr. The Rat in Laboratory Investigation

Gay, W. Methods of Animal Experimentation Vol 1

Institute of Laboratory Animal Resources. Laboratory Animals

Institute of Laboratory Animal Resources. Standards for the Breeding, Care and Management of: Mice, Rats, Guinea Pigs, Rabbits, Hamsters, Dogs, Cats and Monkeys

Lane-Petter, W. Animals for Research

Lumb, William V. Small Animal Anesthesia

National Institute of Health. Guide for Laboratory Animal Facilities and Care

Short, D. J. and D. P. Woodnott. The ATA Manual of Laboratory Animal Practice and Techniques

Smith, Robert H. Electrical Anesthesia

Snell, G.D. Biology of the Laboratory Mouse

Teklad Incorporated. Physiological Data for Common Laboratory Animals

INSTRUCTIONAL MEDIA

American Medical Association, Motion Picture Library,
535 North Dearborne Street, Chicago, Illinois 60610

Physiology of Reproduction In The Rat. 16 mm., 19 min., sound, color.

Shows the contrasting behavior of the female rat during the period of estrus with her behavior between periods. External behavior of both male and female during mating is shown. Time lapse photography shows the penetration of the ovum by the spermatozoa.

Technic of Injection in Animals (Parts I and II

Part I - 16 mm., 12 min., silent, color.

Shows general instructions and precautions in the use of syringes and needles.

Part II - 16 mm., 15 minutes, silent, color

Demonstrates the various routes of injection in different laboratory animals.

American Veterinary Medical Association, Film Library,
600 South Michigan Avenue, Chicago, Illinois 60605

So Life May Continue. 16 mm., 18 min., sound, black and white.

Deals with laboratory animal medicine as it applies to research, the handling and care of laboratory animals, the preparation of the animals for research projects and the use of a germfree surrounding during research are given in detail. Shows also the importance of health and properly maintained laboratory animals, in order to obtain definitive research results.

Audio-Visual Support Center (forward request to: Commanding General in the U. S. Army area in which the borrower resides).

Animals For Research. 16 mm., 28 min., sound, color. Describes the procedures and techniques employed in breeding disease-free animals for use in scientific research projects. Also involves techniques and equipment used in maintaining a disease free colony and the transportation of the animals to research laboratories.

Which Fate. 16 mm., 20 min., sound, color. Presents the case of dog experiments in medical research, e.g., waste vs humanitarian progress. It dispels the protests of antivivisectionists and shows the great benefits of such experimentation to both man and animals.

Encyclopaedia Britannica Educational Corporation,
1822 Pickwick Avenue, Glenview, Illinois 60025.

Foods and Nutrition. 16 mm., 11 min., sound, black and white. Analyzes normal dietary requirements of carbohydrates, fats, proteins, minerals, vitamins and water. Depicts absorption and transformation of sugars and storage of fats. Portrays the metabolism of carbohydrates, fats and proteins.

Scientific Method. 16 mm., 12 min., sound, color. Explains the steps of the scientific method, demonstrates the way this method of problem solving is applied by scientists and discusses the value of scientific thinking in dealing with problems of everyday life.

Friskies - (Attention Editor Friskies Pet Digest)
5045 Wilshire Boulevard, Los Angeles, California 90036.

Feeding for Health. (The Basic Nutritional Requirements for Dogs and Cats). 16 mm., 28 min., sound, color.

The basic nutrient requirements of dogs and cats are discussed, these include proteins, fats, vitamins, minerals and caloric requirements. Charts illustrate the important elements of nutrition.

Lederle Laboratories, American Cyamid Co., Film Library,
Pearl River, New York

Vitamins and Some Deficiency Diseases. 16 mm., 35 min., sound, color.

This film deals with vitamins A, C, D, E and K and also with the B complex vitamins. Laboratory scenes demonstrate deficiencies in laboratory animals including cheilosis, scurvy, rickets, pellagra and vitamin K deficiency.

Maryland Society For Medical Research, 522 West Lombard Street,
Baltimore, Maryland 21201

Handling Laboratory Animals. 16 mm., 19 min., sound, black and white.

Film depicts the most effective methods of handling the mouse, guinea pig, rat, hamster, frog, ferret, rabbit, chicken, cat, dog and monkey.

Study From Life. Part I: Laboratory Animals In Laboratory Research. 16 mm., 32 min., sound, color.

Tells in detail the story of the development of the artificial heart pacemaker, stressing the personal responsibility of the researcher in the care and use of laboratory animals in medical research.

The Avitaminosis. 2 x 2 color slides

Color slides show the results of vitamin deficiency experiments on animals and clinical observation on man.

National Medical Audiovisual Center (Annex). Station K,
Atlanta, Georgia 30324.

Explorations In Laboratory Animal Care. 16 mm., 22 min., sound, color.

Motivates animal technicians to higher levels of performance and interest by stressing the importance of their role in biological and medical research. Demonstrates some of the fundamental problems and responsibilities in maintaining environmental stability in animal colonies.

Laboratory Dogs. 16 mm., 17 min., sound, black and white.

Film stresses the importance of good care, environmental surroundings and husbandry in properly maintaining a group of dogs which have undergone different types of experimental surgery.

Safe Handling of Laboratory Animals. 16 mm., 15 min., sound, color.

Demonstrates techniques used by animal technicians in the proper handling of laboratory animals. Emphasizes methods of avoiding injury and infection both to the technician and his animals; these methods include restraining of monkeys and proper lifting of dogs.

ENGLISH COMPOSITION II (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class 3

DESCRIPTION

A supplemental course designed to extend and elaborate the study and practice of expression and narration established in English Composition I. To accomplish the objectives of this course writing practice continues with a comprehensive study of persuasion as it relates to contemporary issues in literary criticism. The student also receives an introduction to some of the major classifications of literature; namely, the short story and novel (fiction), drama and poetry. A study of literary structural techniques is also included.

MAJOR DIVISIONS

		Class Hours
I.	Persuasion	10
II.	Literature	23
	Total	33

I. PERSUASION

Units of Instruction

1. Objectives

a. The student should be made aware that persuasion is a more advanced mode that is built upon and makes use of all four of the modes studied in English Composition I.

b. That persuasion involves relatively complex assertions.

c. That persuasion is characterized by specific kinds of connections between the parts of his composition (but, if.....then, since.....therefore).

d. Appreciate as primary objectives such matters as examination of evidence, consideration of opposite points of view, (i.e., audience), tone, and writer responsibility.

2. Content

   a. Close study of persuasive prose

   b. Writing practice

II. LITERATURE

Units of Instruction

1. Objectives

   a. The student should understand the basic elements of fiction, poetry, and drama with a view toward critical understanding and esthetic appreciation.

   b. Understand the concepts of plot, characterization, conflict, point of view, setting, theme, and validity of interpretation in fiction; rhythm, sound, imagery, diction, form, theme, and validity of interpretation in poetry; action, dialogue, audio-visual effects, character and conflict development, theme, and validity of interpretation in drama.

c. Identify the above concepts in works of literature and explain the way they contribute to the meaning of various literary work.

2. Content

   a. Close reading of selected works of fiction, poetry, and drama.

   b. Writing of short critical papers, with emphasis on persuasion.

TEXT AND REFERENCES

Guth, H. Literature.

Rohrberger, M. et. al. An Introduction to Literature

Schneider, W. The Range of Literature.

ANIMAL SCIENCE TECHNOLOGY CURRICULUM

FIFTH TERM COURSE SCHEDULE

Animal Nutrition 267
General Pathology 277
Hematology and Urinalysis 290
Introductory Economics 307
Selected Animal Science Elective Courses

ANIMAL NUTRITION

HOURS REQUIRED

Class, 3.

DESCRIPTION

An introductory agricultural division course designed to encompass, generally the fundamental principles of animal nutrition through a study of the essential components of feed, as well as its digestion and utilization by the animal body.

The importance of vitamins, mineral salts, and trace elements to normal physiological function in animals is emphasized. The effects of antibiotics, hormones and other growth stimulating substances is also discussed.

In order to provide a diversified instructional approach to this course, an effort is made to consider applied aspects of this science, where possible, as it relates to large domestic animals, companion (pet) animals and laboratory animals.

General consideration is given to manufacturing methods and quality control procedures relating to the various types of animal feeds.

In addition to the lecture series, instructional techniques intended to enhance the study of nutrition, also includes field trips, audio visual supplements and the completion of feed formulation problems relating to the nutritional requirements of various classes of animals.

MAJOR DIVISIONS

		Class Hours
I.	Introduction to Nutrition	1
II.	Digestion and Absorption of Food	2
III.	Determining the Analysis and Usefulness of Animal Feeds	3
IV.	Values of Feed Concentrates	2
V.	Factors Affecting Feed Values	2
VI.	Nutritional Maintenance of Animals	3
VII.	The Carbohydrate Needs of Animals	2
VIII.	The Lipid Needs of Animals	2
IX.	The Protein Needs of Animals	2
X.	Mineral Needs of Animals	2
XI.	Vitamins: Importance and Function	2
XII.	Antibiotics, Hormones and Other Growth Stimulating Substances	3
XIII.	Present Methods Utilized In the Manufacture of Feeds	2
XIV.	Quality Control Methods Relating to Feeds	3
XV.	Future Development in the Field of Animal Nutrition	2
	Total	33

I. INTRODUCTION TO NUTRITION

Units of Instruction

1. The organic compounds of plant and animal tissues and their functions.
    - a. Proteins
    - b. Carbohydrates
    - c. Fats
2. Functions of water in plants and animals
3. Fundamental differences between plants and animals in nutrient utilization and storage
4. Definitions of common feeding terms
    - a. Roughage
    - b. Concentrate
    - c. Protein
    - d. Carbohydrates
    - e. Fat
    - f. Fibre
    - g. Nutrient
    - h. Digestible nutrient
    - i. Ration
    - j. Balanced ration
5. Feed laws relative to labeling the composition of manufactured feeds.

II. DIGESTION AND ABSORPTION OF FOOD

Units of Instruction

1. Processes involved in digestion
2. Enzyme action
3. The digestive systems of farm animals
    - a. Ruminant digestive systems
    - b. The digestive system of the horse
    - c. The digestive system of the dog
4. The circulatory system of animals
5. The lymphatic system

6. The absorption of food in the villi
7. Metabolism
    a. Utilization of nutrients
8. The endocrine system
9. Disposal of waste by animals
    a. Digestive tract
    b. Kidneys
    c. Lungs
    d. Skin

III. DETERMINING THE ANALYSIS AND USEFULNESS OF ANIMAL FEEDS

Units of Instruction

1. Feeding tests
    a. Conducting feeding trials
2. Determining total digestible nutrients
3. Nutritive ratio
4. Respiration calorimeter
5. Net energy feed values
6. Net energy values expressed in therms
7. Comparison of net energy values with T.D.N.
8. Scandanavian feed unit system
    a. All feeds are compared with 1 pound of barley as a unit of comparison

IV. VALUES OF FEED CONCENTRATES

Units of Instruction

1. Commonly used concentrate feeds
    a. Nutrient content
    b. Use for larger animals

c. Use for small animals

d. By product feeds and how they are derived

V. FACTORS AFFECTING FEED VALUES

Units of Instruction

1. Grinding of grain
2. Grind of hay
3. Cooking and fermenting
4. Liberal and scanty feeding and digestion
5. Unbalanced rations and digestibility

VI. NUTRITIONAL MAINTENANCE OF ANIMALS

Units of Instruction

1. Maintenance needs of animals
    a. Ration must supply
        1) Heat
        2) Energy
        3) Protein
        4) Mineral
        5) Vitamins
        6) Water
        7) Air
2. Maintaining body temperatures
3. Normal body temperatures
    a. Horse
    b. Cow
    c. Hog
    d. Sheep
    e. Dog
    f. Laboratory rodents
4. Regulation of body temperatures
    a. Various means of regulation
        1) Physical regulation
        2) Chemical regulation
        3) Circulation of blood to surface
        4) Sweating

        - 5) Involuntary oxidation - shivering
        - 6) Heat increment
    - 5. Maintenance requirements and body weight
    - 6. Factors affecting maintenance
    - 7. Nutrient sources during starvation
        - a. Glycogen
        - b. Fat in body tissues
        - c. Protein in body tissues
    - 8. Mineral requirements and maintenance

VII. THE CARBOHYDRATE NEEDS OF ANIMALS

Units of Instruction

- 1. Carbohydrates and animal metabolism
    - a. Composition and chemistry
    - b. Determination for nutritional purposes
    - c. Metabolism

VIII. THE LIPID NEEDS OF ANIMALS

Units of Instruction

- 1. Lipids and animal metabolism
    - a. Classification of liquids
    - b. The fatty acids
    - c. Body fat
    - d. Lipid metabolism
    - e. Fat deposition
    - f. Ketosis

IX. THE PROTEINS NEEDS OF ANIMALS

Units of Instruction

- 1. Protein composition
- 2. Protein and nutritive values

3. Supplementary effects of protein
4. Proteins of cereal grains
5. Proteins of milk and milk products
6. Proteins of other animal products
7. Proteins of legume seeds
8. Proteins of other concentrate feeds
9. Proteins of green forage and roughage

X. MINERAL NEEDS OF ANIMALS

Units of Instruction

1. Functions of minerals
2. Salt needs
3. Calcium and phosphorus
4. Calcium and phosphorus content of feeds
5. Deficiency disease due to lack of calcium and phosphorus
6. Calcium supplemental feeds
7. Phosphorus supplements
8. Iodine needs
    - a. Iodine deficiency disease - goiter
9. Iron cobalt and copper neads
    - a. Deficiency diseases
    - b. Mineral supplements
10. Mineral mixtures

XI. VITAMINS - IMPORTANCE AND FUNCTIONS

Units of Instruction

1. Vitamin A
    - a. Function of Vitamin A
    - b. Deficiency diseases due to lack of Vitamin A
    - c. Feed higher in Vitamin A
    - d. Vitamin A variations in milk

2. Vitamin D importance and function

a. Sources of Vitamin D

3. B Complex Vitamins

4. Vitamin C

a. Ascorbic acid

5. Vitamin E

a. Fertility affected by Vitamin E

XII. ANTIBIOTICS, HORMONES AND OTHER GROWTH STIMULATING SUBSTANCES

Units of Instruction

1. Antibiotics
   a. Growth response in animals
2. Hormones and other feed additives

XIII. PRESENT METHODS UTILIZED IN THE MANUFACTURE OF FEEDS

Units of Instruction

1. Large animal feed
2. Companion (pet animal) feed
3. Laboratory animal feed

XIV. QUALITY CONTROL METHODS RELATING TO FEEDS

Units of Instruction

1. Laboratory determination
   a. Nutritional
   b. Microbiological

XV. FUTURE DEVELOPMENTS IN THE FIELD OF ANIMAL NUTRITION

Units of Instruction

1. Experimentation to more qualitatively determine the nutritional requirements of animals and the inobvious effects of deficiencies

    - a. Vitamins
    - b. Minerals
    - c. Trace elements

2. The causes and effects of nutritional stress
3. Nutritional stimulation of productivity
4. Nutritional approaches to combating some disease conditions
5. Compounding of new feed formulations

TEXT AND REFERENCES

Campten and Harris. Applied Animal Nutrition

Maynard and Loosi. Animal Nutrition

Morrison. Feeds and Feeding

Selected current papers from technical reviews and journals.

INSTRUCTIONAL MEDIA

Audio Visual Film Library, Department M-497, Eli Lilly and Company, Indianapolis, Indiana 46206

Vitamins and Your Health, 16 mm., 20 min., sound, color.

This film is an animated presentation of the story of vitamins.

Encyclopaedia Britannica Educational Corporation, 1822 Pickwick Avenue, Glenview, Illinois 60025

Foods and Nutrition, 16 mm., 11 min., sound, black and white.

Analyzes normal dietary requirements of carbohydrates, fats, proteins, minerals, vitamins and water. Absorption and transformation of sugars and storage of fats is also depicted.

Editor, Friskies Pet Digest, 5045 Wilshire Boulevard,
Los Angeles, California 90036

Feeding for Health, 16 mm., 28 min., sound, color.

The basic nutrient requirements of dogs and cats are discussed, including: fats, carbohydrates, proteins, vitamins, minerals and caloric requirements. Cut-away illustrations depicting various parts of the dog's anatomy are used in explaining the role of various food elements.

Film Library, Lederle Laboratories, American Cyanamid Company,
Pearl River, New York

Vitamins and Some Deficiency Diseases, 16 mm., 35 min., sound, color.

This film is presented in two sections; one dealing with Vitamins A, D, D, E and K; the other with the Vitamin B complex. Laboratory scenes depict deficiencies in laboratory animals.

Extension Media Center, Distribution, University of California,
Berkley, California 94720

Digestion, Part I, 16 mm., 15 min., sound, black and white.

A step by step presentation of the mechanical (muscular) processes involved in the digestion of food. An analysis of peristolsis and segmentation are shown. The absorption of digested food, water and salts into the blood is described in detail.

Digestion, Part II (Chemical), 16 mm., 18 min., sound, black and white.

This film shows the chemical changes involved in the body during the digestion of carbohydrates, proteins and fats.

GENERAL PATHOLOGY

HOURS REQUIRED

Class, 2; Laboratory, 2.

DESCRIPTION

An elementary study designed to acquaint the student with changes occurring in animal tissues as the result of disease. Having acquired a basic understanding of how and why abnormalities or lesions develop in the body, the technician is better equipped to observe clinically the first signs of sickness or disease. Likewise, there is more awareness and understanding as to what course of action must be taken under the direction of the veterinarian.

The lecture periods will be used to outline the basic principles of veterinary pathology. Instructional films will be used where applicable and available. Laboratory sessions will be structured so as to illustrate and demonstrate those concepts and principles discussed in lecture. Laboratory study will be implemented through the use of both macro- and microscopic tissue specimens.

Further experience will be gained through student involvement in performing necropsies as often as opportunities for this are presented.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. Introduction and Historical Development of Pathology	3	The Laboratory Exercises are not designed to correlate with lectures. Laboratory sessions are enumerated following lecture outline information.
II. Etiology		
1. Intrinsic Causes of Disease . . .	1	
2. Extrinsic Causes of Disease of a Nutritional Nature		
a. General Nutrients	2	
b. Minerals	5	
c. Vitamins	3 1/2	
3. Extrinsic Causes of Disease of Physical, Chemical and Viable Natures		
a. Types of Physical Influences	3 1/2	
b. Chemical Influences	2	
c. Viable Influences	2	
Totals	22	11

I. INTRODUCTION AND HISTORICAL DEVELOPMENT OF PATHOLOGY

Units of Instruction

1. Ancient history
2. Recent history
3. Definitions
4. The study of pathology

II. ETIOLOGY

Units of Instruction

1. Intrinsic causes of diseases
    a. Definition
    b. Groups of intrinsic causes
        1) Genus
        2) Race
        3) Breed
        4) Family
        5) Age
        6) Sex
        7) Color
        8) Idiosyncrosy
2. Extrinsic causes of diseases of a nutritional nature
    a. Terminology
    b. Excess of food
    c. Deficiency of food
    d. General nutrients
        1) Protein
        2) Carbohydrate
        3) Fat
        4) Water
    e. Minerals
        1) Sodium chloride
        2) Calcium
        3) Phosphorus
        4) Magnesium
        5) Manganese

6) Iron
7) Copper
8) Cobalt
9) Iodine
10) Zinc
11) Fluorine
12) Tin

f. Vitamins
1) Vitamin A
2) Thiamine
3) Riboflavin
4) Niacin (Nicotinic Acid)
5) Pantothemic Acid
6) Pyriodoxine
7) Vitamin C (Ascorbic Acid)
8) Vitamin D
9) Vitamin E
10) Vitamin K

3. Extrinsic causes of disease of physical, chemical and viable natures

a. Types of physical influences and injuries
1) Trauma
a) Hemorrhage
b) Shock
c) Bacterial infection
d) Contusion
e) Abrasion
f) Incision

g) Laceration

h) Perforation

i) Rupture

j) Fracture

k) Concussion

l) Sprain (strain)

m) Luxation (dislocation)

2) Pressure injuries

a) Cause

b) Localized pressure

c) Recumbent animals

d) Long acting mild pressures

3) Obstructive injuries

4) Malposition injuries

a) Volvulus

b) Torsion

c) Intussusception

d) Prolapse

e) Eversion

f) Eventration

g) Hernia

h) Strangulation

5) Injuries due to temperature changes

a) Excessive heat retention

b) Excessive heat application (burns)

c) Excessive cold

d) Beneficial effects of cold

- 6) Injuries resulting from atmospheric pressure changes
  - a) Excessive pressures
  - b) Low atmospheric pressure
- 7) Light induced injuries
  - a) Excessive light
  - b) Inadequate supply of light
- 8) Electrically induced injuries
- 9) Ionizing radiation injuries

b. Chemical influences of disease

- 1) Exogenous poisons
  - a) Types encountered
  - b) Occurrence of exogenous poisoning
  - c) Body defenses against poisons
- 2) Endogenous poisons

c. Viable influences

- 1) Terminology
- 2) Etiology
  - a) Characteristics which aid microorganisms in producing disease
  - b) Factors controlling "contagiousness" of a disease
  - c) Septicemic diseases vs localized diseases
- 3) Channels of infection
- 4) Defenses against infection
- 5) Period of incubation

6) Pathogenesis
   - a) Terminology
   - b) Lesions
   - c) Course
   - d) Termination of illness

7) Protozoan and metazoan forms of animal life
   - a) Kinds
   - b) Anemia
   - c) Hemorrhage
   - d) Spleen
   - e) Degeneration and death of cells
   - f) Tissue proliferation
   - g) Mechanical obstruction of hollow organs

8) Stress

LABORATORY EXERCISES

EXERCISE I HISTOLOGICAL REVIEW OF BODY SYSTEMS (NORMAL)

1. Skeletal system
2. Muscular system
3. Circulatory system
4. Nervous system
5. Digestive system
6. Respiratory system
7. Endocrine system
8. Urinary system
9. Reproductive system

EXERCISE II NECROPSY AND STUDY OF PATHOLOGICAL CHANGES

1. Veterinary necropsy technique
2. Circulatory changes
   a. Hyperemia
      1) Acute general active hyperemia
      2) Acute local active hyperemia
3. Microscopic and gross study of specimens illustrating cases of hyperemia

EXERCISE III CIRCULATORY CHANGES (CONTINUED)

1. Study of:
   a. Acute general passive congestion
   b. Chronic general passive congestion
   c. Acute local passive congestion
   d. Chronic local passive congestion
   e. Hypostatic congestion
2. Examination of histological and gross specimens illustrating congestions

EXERCISE IV CIRCULATORY CHANGES (CONTINUED)

1. Study of:
   a. Anemia
   b. Hemorrhage
   c. Edema
2. Examination of histological and gross specimens illustrating the pathological changes studied

EXERCISE V CIRCULATORY CHANGES (CONTINUED)

1. Study of:
   a. Thrombosis
   b. Post-mortem blood clotting
   c. Embolism
   d. Infarction
2. Examination of histological and gross specimens illustrating the circulatory changes discussed

EXERCISE VI CELL AND TISSUE CHANGES

1. Study of:
   a. Aplasia
   b. Hypoplasia
   c. Atrophy
   d. Hypertrophy
   e. Hyperplasia
   f. Metaplasia
   g. Anaplasia (Neoplasia)
2. Examination of histological and gross specimens illustrating the cell and tissue changes discussed

EXERCISE VII TISSUE DEGENERATIONS

1. Study of:
   a. Cloudy swelling of cells
   b. Hydropic degeneration
   c. Mucinous and mucoid degeneration
   d. Zenkers degeneration
2. Examination of related histological and gross specimens

EXERCISE VIII   TISSUE DEGENERATIONS (CONTINUED)

1. Study of:
   - a. Amyloidosis
   - b. Fatty infiltration
   - c. Fatty degeneration
   - d. Abnormal calcification of tissues
2. Examination of related histological and gross specimens

EXERCISE IX   CELLULAR NECROSIS

1. Study of:
   - a. Coagulative necrosis
   - b. Focal necrosis
   - c. Caseous necrosis
   - d. Fat necrosis
2. Examination of related histological and gross specimens

EXERCISE X   INFLAMMATION

1. Study of:
   - a. General
   - b. Cardinal signs of inflammation
   - c. Circulatory changes in inflammation
   - d. Cellular changes of inflammation
   - e. Exudation
   - f. Definition of terms relating to inflammation
   - g. Comparison of acute and chronic inflammation
2. Examination of related histological and gross specimens

EXERCISE XI NEOPLASMS

1. Study of:
    a. Definition of terms related to subject of neoplasms
    b. How tumors are spread
    c. Histogenic classification of tumors
    d. Microscopic appearance of tumors
    e. Factors indicating the degree of anaplasia present
2. Examination of related and selected histological and gross specimens.

REFERENCE TEXTS AND MATERIALS

Benjamin, Maxine M. Outline of Veterinary Clinical Pathology, Second Edition.

Boyd, William. Pathology for the Physician.

Coffin, David L. Manual of Veterinary Clinical Pathology, Third Edition.

Cohrs, Paul. Textbook of the Special Pathological Anatomy of Domestic Animals.

Geschickter, Charles F. and Albert Cannon. Color Atlas of Pathology, Volume III.

Gresham, G. A. and A. R. Jennings. An Introduction to Comparative Pathology.

Jubb, K. V. F. and Peter C. Kennedy. Pathology of Domestic Animals.

National Naval Medical Center. Color Atlas of Pathology, Volume I.

National Naval Medical Center. Color Atlas of Pathology, Volume II.

Runnells, R. A., W. S. Monlux and A. W. Monlux. *Principles of Veterinary Pathology*.

Smith, H. A. and T. C. Jones. *Veterinary Pathology*.

INSTRUCTIONAL MEDIA

Alden Films (McGraw-Hill) 5113-16th Avenue, Brooklyn, New York

Stress. 16 mm., 11 min., sound, black and white.

Explains the nature of "stress" as a general alarm reaction through the pituitary and adrenal glands, set off by an attack on the body such as disease, injury or mental pressure.

Association Films, Inc., Schering Professional Film Library,
Broad and Elm, Ridgefield, New Jersey 07657

Frontiers of Allergy. 16 mm., 25 min., sound, color.

Illustrates current concepts of the basic mechanisms of allergy through animated drawings interspersed with live sequences that demonstrate clinical application of these concepts.

Skin Diseases in Animals. 16 mm., 25 min., sound, color.

Presents typical examples of various skin conditions of large and small animals.

Department of Communication Arts, College of Agriculture,
Cornell University, Ithaca, New York 14850

Radiation Effects on Farm Animals. 16 mm., 13 min., sound, color.

Shows symptoms of pathological changes caused by exposure to to high amounts of radiation. Discusses the effects on the circulatory, digestive, respiratory and nervous systems. Damage and regeneration of body cells is described through means of animation.

Encyclopaedia Britannica Educational Corporation, 1822 Pickwick Avenue, Glenview, Illinois 60025

Body Defenses Against Disease. 16 mm., 11 min., sound, black and white.

Illustrates how the body defends itself against disease.

Lederle Laboratories, Film Library, American Cyanamid Company, Pearl River, New York

The Inflammatory Reaction. 16 mm., 26 min., sound, color.

Details the response of living tissue to trauma and injury.

National Medical Audiovisual Center (Annex), Chamblee, Georgia 30005 (Attention: Film Distribution)

Congestive Heart Failure. 16 mm., 10 min., sound, color.

Explains how a weakened heart reacts when excessive demands are made on it.

Worms in Your Muscles. 35 mm., film strip - 52 frames, 10 min., sound, black and white.

Discusses the life cycle of trichinella spiralis, the medical implications of trichinosis, and control measures and consumer precautions.

HEMATOLOGY AND URINALYSIS

HOURS REQUIRED

Class, 2; Laboratory, 2.

DESCRIPTION

A laboratory study of vertebrate blood including principles and practices of total and differential counts, coagulation, sedimentation, hemoglobin determinations, packed cell volume, blood grouping and other tests deemed important in animal science. Lecture and laboratory coverage of the kidney, its function and the parameters utilized to determine any abnormalities of the urine.

Lecture periods are devoted to the anatomy and physiology of the cardiovascular and renal systems, their constituents and related body fluids. Laboratory periods involve instruction on the collection, preparation and examination of blood and urine including those examinations and reactions utilized in diagnostic evaluations.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Introduction to Hematology	1	1
II.	Erythrocytes	3	3
III.	Leukocytes	4	2
IV.	Thrombocytes	1	½
V.	Spleen	1	0
VI.	Hemopoiesis	2	½

VII.	Erythrocytes in Disease	2	2
VIII.	Plasma Proteins	1	
IX.	Coagulation	1	
X.	Lymph	1	
XI.	Reticulo-Endothelial System	1	0
XII.	Leukemias	1	0
XIII.	Urinalysis	3	2
	Total	22	11

I. INTRODUCTION TO HEMATOLOGY

Units of Instruction

A. Definition of terms

B. Basic functions of blood

C. Structure of blood cellular components

D. Plasma constituents

E. Reaction of blood and homeostasis

1. pH of the blood system
2. Regulation of acidity and alkalinity

F. Specific gravity of blood

G. Fluids and fluid balances of the body

Laboratory Exercises

1. Introduction to the hematology laboratory
2. Familiarization with the equipment used in hematological determinations.
3. Preparation of basic blood smears

II. ERYTHROCYTES

Units of Instruction

A. General description

B. Size and number of red blood cells

C. Individual variation in animals

D. Erythrocyte surface area

E. Erythrocyte composition

F. Hemolysis

    1. Methods of producing

G. Hemagglutination

H. Erythropoiesis

    1. Fetal production of red cells
    2. Adult production of red cells
    3. Precursors of red cells

I. Vitamins and red cell production

    1. Extrinsic and intrinsic factors

J. Fate of erythrocytes

    1. Phagocytosis
    2. Reticulo-endothelial system

K. Anemia

L. Hemoglobin

    1. Description and chemical composition
    2. Species variation
    3. Oxyhemoglobin
    4. Myoglobin
    5. Carboxyhemoglobin
    6. Methemoglobin

Laboratory Exercises

1. Preparation and counting of the red blood cell count utilizing the standard pipettes and the Uno-pette system

2. Preparation and reading of the hematocrit or or packed cell volume
3. Preparation and interpretation of the hemoglobin determination utilizing several different methods on a comparative basis
4. Analysis of red blood cells on a prepared slide to determine the various differences in cell types found in the normal smear
5. Practical exercises in the above hematological determinations using clinical blood samples from human, equine, bovine, canine, feline and various laboratory animal sources of blood.

III. LEUKOCYTES

Units of Instruction

A. General considerations
B. Terminology involving leukocytes
C. Granulocytic series
    1. Neutrophils (heterophils)
    2. Eosinophils
    3. Basophils
D. Monocytic series
    1. Monocytes
    2. Lymphocytes
E. Hormonal effects on leukocytes
    1. Adrenal corticosteroid effects
    2. Functional hematological triad
F. Leukocyte response in disease
G. Total and differential leukocyte response
    1. Regenerative left shift

2. Degenerative left shift
3. Absolute leukocyte counts

II. Biology of inflammatio

1. Leukotaxine
2. Leukocytosis-promoting factor
3. Necrosin
4. Corticosteroid activity in inflammation

Laboratory Exercises

1. Preparation and counting of total white blood cell counts utilizing the standard and the Uno-pette systems of white cell determination
2. Preparation of the differential smear and the various staining techniques involved in routine hematological examinations.
3. Identification and classification of the various cell types in the leukocytic series.
4. Clinical practice in identification and counting of leukocyte cells using blood samples of human, equine, bovine, canine, feline and various laboratory animal species.

IV. THROMBOCYTES

Units of Instruction

A. General considerations
B. Origin and development of thrombocytes
C. Thrombocytopenia
D. Thrombocytosis
E. Platelet count

Laboratory Exercises

1. Instruction in the preparation, examination and counting of platelets
2. Clinical practice in the determination of platelet counts using the various blood samples from available species

V. SPLEEN

Units of Instruction

A. General considerations
B. Function of splenic tissues
    1. Necessity for life
    2. Red blood cell reservoir
    3. Destruction of red blood cells
    4. Physiological leukocytosis
    5. Antibody production in the reticulo-endothelial system
    6. Iron storage

Laboratory Exercises

1. There are no scheduled laboratory procedures involving the spleen as a separate entity

VI. HEMOPOIESIS

Units of Instruction

A. Granulocytic series
    1. Myeloblast
    2. Progranulocyte
    3. Myelocyte
    4. Metamyelocyte
    5. Band cells
    6. Segmented cells

B. Lymphocytic series
    1. Lymphoblast
    2. Prolymphocyte
    3. Lymphocyte

C. Monocytic series
    1. Monoblast
    2. Promonocyte
    3. Monocyte

D. Thrombocytic series
    1. Megakaryoblast
    2. Promegakaryocyte
    3. Megakaryocyte
    4. Thrombocyte

E. Erythrocytic series
    1. Rubriblast
    2. Prorubricyte
    3. Rubricyte
    4. Metarubricyte (normoblast)
    5. Reticulocyte
    6. Mature erythrocyte

Laboratory Exercises

1. Examination of prepared blood smears from bone marrow of animals in the vivarium in order to identify the various stages of each blood cell type series.

VII. ERYTHROCYTES IN DISEASE

Units of Instruction

- A. General considerations of anemias
- B. Causes of anemic conditions
- C. Morphological classification of anemias
  - 1. Mean corpuscular volume
  - 2. Mean corpuscular hemoglobin
  - 3. Mean corpuscular hemoglobin concentration
- D. Relative cell sizes in anemia
  - 1. Microcytic anemias
  - 2. Macrocytic anemias
  - 3. Normocytic anemias
- E. Hemoglobin concentrations
  - 1. Hypochromic anemias
  - 2. Hyperchromic anemias
  - 3. Normochromic anemias
- F. Etiologic classification of anemias
  - 1. Blood loss anemias
  - 2. Hemolytic anemias
  - 3. Antigen-antibody reaction anemias
  - 4. Secondary anemic conditions
  - 5. Nutritional deficiency anemias
  - 6. Aplastic anemias
- G. Abnormalities involving the red blood cell
  - 1. Microcytosis
  - 2. Macrocytosis
  - 3. Anisocytosis
  - 4. Poikilocytosis
  - 5. Leptocytosis

6. Polychromatophilia

H. Interpretation and correlation of hematological values

1. Mean corpuscular volume interpretation
2. Mean corpuscular hemoglobin concentration interpretation
3. Correlation of acute and subacute hemorrhagic conditions
4. Correlation of hemolytic conditions
5. Correlation of bone marrow depression conditions

I. Erythrocyte sedimentation rate

1. Determination procedures
2. Interpretation in diseased conditions

Laboratory Exercises

1. Examination of blood smears for purposes of identification of various red cell abnormalities discussed in lecture
2. Determination and practical experience in setting up and reading the erythrocyte sedimentation rate on various animals involved in veterinary and biomedical situations.
3. Calculation of anemic indices and interpretation of the values under veterinary supervision

VIII. PLASMA PROTEINS

Units of Instruction

A. Electrolyte composition of plasma

1. Cations
2. Anions
3. Plasma vs. serum in clinical applications

B. Proteins

   1. Osmotic forces
   2. Buffer systems of blood
   3. Antibody formation
   4. Clotting ability
   5. Transportation of hormones
   6. Albumin
   7. Alpha globulin
   8. Beta globulin
   9. Gamma globulin
   10. Fibrinogen

Laboratory Exercises

   1. Determination of plasma protein concentration of blood is demonstrated in laboratory

IX. COAGULATION

Units of Instruction

- A. General considerations
- B. Principles of hemostasis
- C. Thromboplastic activity
- D. Prothrombin conversion
- E. Fibrinogen conversion
- F. Clot retraction
- G. Clot dissolution
- H. Anticlot mechanism
  1. Fibrinolytic system
  2. Heparin activity
- I. Anticoagulants
  1. Oxalates and citrates
  2. Dicoumeral (Warfarin)

J. Hemostasis abnormalities

1. Blood calcium levels
2. Thrombocytopenic purpura
3. Anaphylactic shock

Laboratory Exercises

1. Determination of platelet counts on animals utilizing various methods of platelet analysis
2. Determination of clotting time using clinical methods of nose puncture, prothrombin analysis and other methods utilizing laboratory animals from college vivarium

X. LYMPH

Units of Instruction

A. General considerations

1. Lymphatic vessels
2. Lymph composition
3. Lymph capillaries and osmotic pressure
4. Lymph nodes and their function

B. Conditions of increased lymph flow

1. Increased capillary pressure
2. Capillary wall permiability
3. Hypertonicity
4. Functional activity increase

C. Edema formation

1. Types of edema
2. Mechanical causes of edema
3. Etiological factors of edema
4. Treatment of edema

Laboratory Exercises

1. Clinical studies of lymph are performed in the laboratory in the areas of cell analysis and protein composition.
2. Demonstrations of clinical cases of edema are presented to the student when the clinical material becomes available

XI. RETICULO-ENDOTHELIAL SYSTEM

Units of Instruction

A. Cellular types of the reticulo-endothelial system

B. Fixed reticulo-endothelial cells

1. Connective tissue elements
2. Reticulum of spleen, lymph nodes and liver
3. Endothelial cells of spleen, bone marrow and liver
4. Microglial cells of central nervous system

C. Wandering reticulo-endothelial cells

1. Solid tissue cells that have disengaged
2. Extragenous origin blood cells (heart failure cells, etc.)
3. Monocytic cells

Laboratory Exercises

1. The laboratory procedures for the reticulo-endothelial system are incorporated into the other laboratories, since this system is spread out into the other areas of coverage

XII. LEUKEMIAS

Units of Instruction

A. Forms of leukemia

1. Acute

   2. Chronic

B. Characteristics of leukemias

   1. Leukemic
   2. Subleukemic
   3. Aleukemic

C. Cell types involved in leukemias

   1. Granulocytic
   2. Lymphocytic
   3. Monocytic

D. Leukemias and the relationship to veterinary medicine

Laboratory Exercises

   1. There are no specific laboratories involving leukemias directly, however as clinical material becomes available, the hematological examinations are demonstrated to the student

XIII. URINALYSIS

Units of Instruction

A. Introduction to urinalysis

   1. Homeostasis and the kidney
   2. Blood composition and the kidney
   3. Hormonal effects on the kidney
   4. Primary renal functions

B. Nephron mechanism

   1. Glomerulus and function
   2. Proximal convoluted tubule and function
   3. Distal convoluted tubule and function
   4. Collecting tubules and function

C. Glomerular filtrate

   1. Effective filtration rate

   2. Juxtaglomerular apparatus

D. Tubular filtrate
   1. Proximal convoluted tubule
   2. Tubular maximum
   3. Sodium reabsorption
   4. Urine formation

E. Physical examination of the urine
   1. Quantity
   2. Color
   3. Transparency
   4. Specific gravity

F. Chemical examination of the urine
   1. Reaction or pH
   2. Protein
   3. Proteinuria effects
   4. Glucose
   5. Diabetes mellitus
   6. Acetone (ketone bodies)
   7. Occult blood examination
   8. Hematuria and hemoglobinuria
   9. Myoglobinuria
   10. Bile (ictotest reaction)
   11. Urobilinogen
   12. Indican
   13. Chloride
   14. Calcium (Sulkowitch test)

G. Microscopic urine examination
   1. Epithelial cells
   2. Erythrocytes in urine

3. Leukocytes in urine
4. Casts and their formation
5. Microorganisms in urine
6. Parasites in urine
7. Spermatozoa in urine
8. Crystals in urine

Laboratory Exercises

1. All of the above mentioned physical, chemical and microscopic examinations of urine are performed in the laboratory routinely until the student becomes competent in the fundamental procedures of urinalysis

TEXT AND REFERENCES

Any one of the following books may be selected as a textbook. Others may be used for reference.

Andrew, W. Comparative Hematology.

Archer, R. K. Hematological Techniques for Use on Animals.

Benjamin, M. M. Outline of Veterinary Clinical Pathology.

Berrier, H. H. Diagnostic Aids in Practice of Veterinary Medicine.

Bloom, R. F. The Urine of the Dog and Cat.

Coffin, D. L. Manual of Veterinary Clinical Pathology.

Dacie, J. V. Practical Hematology.

Dukes, H. H. The Physiology of Domestic Animals.

Galton, D. A. G. Hematology and Blood Groups.

Haw, P. B., B. L. Oser, and W. H. Summerson Practical Physiological Chemistry.

Hirschhorn, R. C. Practical Urology.

Leavell, B. S and O. A. M. Thorup Fundamentals of Clinical Hematology.

MacFarlane, R. G. Functions of the Blood

Schalm, O. W. Veterinary Hematology.

Schermer, S. The Blood Morphology of the Laboratory Animals.

Schwartz, S. O. Hematology in Practice.

Seiverd, Charles E. Hematology for Medical Technologists.

Sirridge, M. S. Laboratory Evaluation of Hemostasis.

Vigran, I. M. Clinical Anticoagulant Therapy.

Wintrobe, M. M. Clinical Hematology.

Yoffey, J. M. Quantitative Cellular Hematology.

INSTRUCTIONAL MEDIA

American Society for Microbiology, Ann Arbor, Michigan

Dynamics of Phagocytosis. 16 mm., 25 min., sound, black and white.

Shows process of phagocytosis utilizing Group A Streptococcus bacteria.

The Lymphatic System. 16 mm., 40 min., sound, color.

Descriptive analysis of anatomy and physiology of lymphatic system.

Bell Telephone Company, New York City, New York.

Hemo the Magnificant. 16 mm., 60 min., sound, color.

Blood and circulation by animation and live photography.

Churchill-Werler Film Producers, Los Angeles, California

Circulation, Why and How. 16 mm., 10 min., sound, black and white.

Shows blood circulation, function of red and white cells, heart physiology.

Encyclopedia Brittanica Films Inc., Wilmette, Illinois

Work of the Blood. 16 mm., 13 min., sound, black and white.

Structure and composition of red cells shown by blood sample analysis. Uses animated drawings and radiographic motion photographic techniques.

McGraw-Hill Book Company, New York City, New York

White Blood Cells. 16 mm., 12 min., sound, color

White cell action on bacillus infection shown in photomicrography.

INTRODUCTORY ECONOMICS (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 3

DESCRIPTION

This course is designed to provide the student with a basic understanding of economic concepts and principles and to present practical considerations and insights into major economic problems. Both macroeconomic and microeconomic approaches are analysed using a minimal amount of mathematics. Orientation will be directed toward basic economic theory as it relates to the American economic system. A problem solving conceptual approach, stressing functional situations with which the technology oriented student can relate, will be utilized both in presentation and organization of ideas.

Instruction will include the use of periodicals, text and pertinent assigned readings.

The intent of the course is to build a conceptual framework for understanding the nature of economics and the changing economic world.

MAJOR DIVISIONS

		Class Hours
I.	Introduction to Economics	1
II.	Resource Allocation Through Supply and Demand	3
III.	Business Enterprise	3
IV.	Costs, Prices and Output In Various Markets	2

		Class Hours
V.	Labor	3
VI.	Natural Resources, Capital and Management . .	3
VII.	The Developing Role of Government	2
VIII.	The Consumers Role	2
IX.	The American Economy In Aggregate	3
X.	Money Prices And Role of Banking	2
XI.	Relating Policy to Problems	3
XII.	Economics Viewed Internationally	3
XIII.	Economic Growth	3
	Total	33

I. INTRODUCTION TO ECONOMICS

Units of Instruction

1. Economics as a discipline
    a. Why study economics?
    b. What is economics?
    c. One central problem:
        1) Production--what, how much?
        2) Distribution--for whom?
2. American economic system overview Question: What is basic to every economic system?

II. RESOURCE ALLOCATION THROUGH SUPPLY AND DEMAND

Units of Instruction

1. One market
    a. Price and its influences
    b. Market conditions
2. Supply and demand functions
    a. Supply and demand curves
    b. Price determination through interaction

Question: Is man more social or economic oriented?

III. BUSINESS ENTERPRISE

Units of Instruction

1. Characteristics and organization
2. Evolution, concentration and competition

Question: How much of American business reflects the market system?

IV. COSTS, PRICES, AND OUTPUT IN VARIOUS MARKETS

Units of Instruction

1. Fixed, variable, and total costs
2. Output and price in competitive markets
3. Output and price in imperfectly competitive markets

Question: How do market conditions influence production?

V. LABOR

Units of Instruction

1. Its uses and rewards
    a. Role of labor in production
    b. Wage determination
2. Its organization and development
    a. The labor movement
    b. Labor-management relations
    c. Governmental influence on unions

Question: Automation--threat or promise?

VI. NATURAL RESOURCES, CAPITAL, AND MANAGEMENT

Units of Instruction

1. Their uses and rewards
    a. Production and distribution characteristics of the factors of production

b. Natural resources and rent

c. Capital and interest

d. Management and profits

Question: Does the classical model fairly distribute income to the factors of production?

VII. THE DEVELOPING ROLE OF GOVERNMENT

Units of Instruction

1. Expenditure and revenues of government
2. Government and public finance
    a. Federal tax system
    b. State and local tax revenues
    c. Evaluation of taxation and public debt

Question: Do we need tax reform and new direction for government's role?

VIII. THE CONSUMER'S ROLE

Units of Instruction

1. Consumer sovereignty
    a. Consumer demand and spending
    b. Consumer credit

Question: Caveat emptor vs protection. Does the trend towards an industrial state threaten the economy we know?

IX. THE AMERICAN ECONOMY IN AGGREGATE

Units of Instruction

1. Measures of the economy
    a. National income accounting
    b. Business activity measurement

2. Kemysian analysis

    a. The classical model

    b. The new model

Question: Which model tends to best support and provide a vehicle to reach our economic goals?

X. MONEY, PRICES, AND ROLE OF BANKING

Units of Instruction

1. Relationship of money and prices
2. Banking and the creation of money
    a. Role of federal reserve

Question: Why is inflation one of our most serious problems and what effect does monetary policy have on achieving our economic goals?

XI. RELATING POLICY TO PROBLEMS

Units of Instruction

1. Goals and policy models
2. Problems facing segments of the economy
3. Problems faced by the aggregate economy

Question: What controversy might arise in terms of policy relation to achieving the goals of our economy?

XII. ECONOMICS VIEWED INTERNATIONALLY

Units of Instruction

1. Basis of trade
2. Problems of trade
3. Economic system other than capitalism
    a. Economic theory vs reality

Question: How important is trade to the U.S. economy?

XIII. ECONOMIC GROWTH

Units of Instruction

1. The concepts of growth related to the course
2. Historical perspective of growth
3. Future growth

Question: What seems to be the greatest problem concerned with growth?

TEXT

Gordon, S. et. al. The American Economy: Analysis And Policy

REFERENCES

Grey, A. and J. Elliott. Economic Issues And Policies.

Samuelson, P., R. L. Bishop and John R. Coleman. Readings In Economics.

ANIMAL SCIENCE TECHNOLOGY CURRICULUM

SIXTH TERM COURSE SCHEDULE

Animal Science Seminar 314
Genetics 319
English Composition III 333
Selected Animal Science Elective Courses

ANIMAL SCIENCE SEMINAR

HOURS REQUIRED

Class 2; Laboratory or Library (No formal schedule - time depends upon topic of individual study)

DESCRIPTION

This is a course designed to provide an opportunity to complete an individual study project in some problem area of the student's major field of interest. This seminar may be completed as library research or as a laboratory plus library research project. The study is to be completed under the guidance of one or more of the faculty members. A complete technical paper is required together with an oral presentation for student information and discussion. Professional staff members may be invited to any seminar to aid in the discussion of the topic presented. Each student will orally discuss his own project with emphasis on those phases which warrant discussion. It is expected that a maximum of thirty minutes will be allotted to presentation with time allowed for general group discussion on each topic.

MAJOR DIVISIONS

	Class Hours	Laboratory or Library Hours
I. Mechanics of the Seminar	3	Individual
II. Grading Criteria	1	study-
III. Interim Progress Reports	9	hours
IV. Oral Report	3	as

	Class Hours	Laboratory or Library Hours
V. Written Report	3	required.
VI. Comments	3	
Total	22	

I. MECHANICS OF THE SEMINAR

Units of Instruction

1. Student must obtain permission of a division faculty member who shall act as coordinator for the seminar program.
2. Each student shall submit to the division chairman, the subject for study and the student's preliminary plans of procedure for approval by the division.
3. The coordinator shall establish a schedule for regular meetings with the student in order to guide each student's work and to evaluate his progress.
4. The student will be encouraged to consult other faculty members and resource personnel in the field of study. Facilities outside the college may be utilized in this project.
5. The program shall be initiated during the third term of the second year unless special permission is obtained to start earlier.
6. The faculty advisor shall submit a final grade on each student to the division faculty.
7. Each student is to submit an original and two carbon copies of their technical paper. The original

shall be filed in division headquarters, one copy goes to the project director and one copy is returned to the student.

II. GRADING CRITERIA

Units of Instruction

1. Contribution to the field of interest
2. Clarity and method of organization
3. Adequacy of supporting documentation and illustration of material
4. Efficacy of oral presentation
5. Understanding of the problem area studied.

III. INTERIM PROGRESS REPORTS

Units of Instruction

1. Evaluate progress of student project on a weekly basis.
    a. Laboratory
    b. Library
2. Suggest direction or methods to assist student in completion of project.

IV. ORAL REPORT

Units of Instruction

1. Each report should include the following pertinent information:
    a. Student's name
    b. Clinician
    c. Advisor
    d. Signalment

- e. Anamnesis
- f. Examination
  - 1) Diagnostic examinations
  - 2) Diagnostic tests
- g. Differential diagnosis
- h. Diagnosis
- i. Prognosis
- j. Treatment and/or surgical procedures
- k. Addendum and/or necropsy
- l. Bibliography

1. Discussion
   - a. Each student will discuss the most pertinent material of his project with his peers and faculty.

V. WRITTEN REPORT

Units of Instruction

1. Reason for choice of case and phase of syndrome to be stressed
2. Review of literature
   - a. History of the condition
   - b. Geographic incidence
   - c. Methods of treatment or control
3. Individual case report
   - a. Signalment
   - b. Anamnesis
   - c. Examinations
   - d. Diagnosis
   - e. Prognosis

4. Description of typical clinical procedure
    a. Etiology
    b. Incidence
    c. Symptoms
    d. Diagnostic tests
    e. Necropsy findings
    f. Differential diagnosis
    g. Treatment of choice
    h. Control measures
5. Discussion
6. Bibliography

VI. COMMENTS

Units of Instruction

1. The outline above is the choice of style for a clinical discussion of a case under the care of a clinician.
2. If the student wishes to do a project on a phase of research, the basic research pattern will be followed and the oral and written presentations will be on the standard theme.

TEXT AND REFERENCES

American Institute of Biological Sciences. Style Manual for Biological Journals.

Note: Each individual project will utilize all available resources in that particular area of interest.

GENETICS (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 3; Laboratory, 0.

DESCRIPTIONS

A course intended to endow the student with a background in the conceptual aspects of basic genetics which will enable the application of this science to the biological and animal science fields. In attaining the objectives of this course, consideration is given to cytological and environmental factors pertaining to Mendelian inheritance, gene theory, cytoplasmic phenomena, organizers, chromosomal aberration and mutation. An effort will also be made to establish the interrelationships which genetics has established with cytology, evolution, and morphogenesis as it relates to the welfare of man and animals.

The instructional methods utilized in this course will include selected films, demonstrations and discussion sessions.

MAJOR DIVISIONS

		Class Hours
I.	Origin and Development of the Gene Concept . .	1
II.	Cell Structure and Function	2
III.	Life Cycle	2
IV.	Gene and Chromosome Behavior during Cell Division	2
V.	Sex Linkage and Sex Determination	2

		Class Hours
VI.	Quantitative Inheritance, Multiple Alleles and Pseudoalleles	2
VII.	Nature and Function of Heredity Material	4
VIII.	The Nature and Cause of Mutations	2
IX.	Genes and Metabolism	3
X.	Genes and Development	3
XI.	Behavior Genetics	2
XII.	Extrachromosomal Inheritance	2
XIII.	Population Genetics and Evolution	4
XIV.	Advances In Genetics	2
	Total	33

I. INTRODUCTION

Units of Instruction

The objective of this unit is to provide a brief historical account of the evolution of man's thoughts and knowledge on how hereditary information is transmitted from generation to generation.

Content:

1. Origin and development of the gene concept
    a. Early theory
    b. Origin of cell biology
    c. Origins of modern genetics

II. CELL STRUCTURE AND FUNCTION

Units of Instruction

Any mechanistic interpretation of heredity must be based on an understanding of the physical and chemical nature of cell organization and function, including both the chromosomal and nonchromosomal material. And since there is no science prerequisite for this course it is necessary to orient the student and acquaint him with the terminology which will be needed for later units.

Content:

1. Molecular morphology and function
    a. Lipids
    b. Carbohydrates
    c. Protein
2. Cell morphology and function
    a. Cell wall
    b. Cell membrane
    c. Cytoplasm
    d. Nucleus
        1) Chromosomes
        2) Nucleolus
    e. Centrioles and spindles

III. LIFE CYCLES

Units of Instruction

The purpose of this unit is to consider the life cycles of a variety of representative organisms which are of significance in the study of genetics. It is important to understand life cycles; for all life cycles are genetic systems. The importance of these life cycles and how they help us understand and interpret genetic problems is stressed.

Content:

1. Life cycle
    a. Viruses
    b. Bacteria
    c. Fungi
    d. Protozoa
    e. Higher organisms
2. Roles and types of cell division
    a. Mitosis
    b. Meiosis
    c. Fertilization

IV. GENE AND CHROMOSOME BEHAVIOR DURING CELL DIVISION

Units of Instruction

All living cells come from preexisting cells either by cell division or by cell fusion at the time of fertilization. In either case, cell division is a necessary and important part of the process. Both of these processes were discussed in the previous unit. Since the new cell or cells contain the same or very similar genetic information that was possessed by the mother cells, and it is established that the chromosomes carry the genes from cell to cell and generation to generation, it is important to understand the behavior of the chromosomes and their genes during normal cell division.

Content:

1. Mechanics of segregation
    a. Introduction

    b. Mendel
    c. Probabilities underlying genetic segregation
    d. Monogenic inheritance
2. Two and three-gene segregations - independent assortment
3. Linkage
4. Crossing over
5. Chromosome mapping

V. SEX LINKAGE AND SEX DETERMINATION

Units of Instruction

In the previous unit autosomal chromosome and gene behavior was discussed. A point has now been reached where consideration must be given an important exception to the concept of paired and equal chromosomes. The exception is the sex chromosome, where behavior with respect to genes displays a particular pattern of inheritance.

A discussion of sex chromosomes and of sex-linked inheritance would naturally lead into a discussion of sex determination. Therefore consideration in this unit will be given to a few of the many known mechanisms, both genetic and environmental, of sex determination.

Content:

1. The XO situation
2. The XY situation
3. Sex linkage
4. Sex-influenced genes

5. Sex-limited genes

6. Sex determination

VI. QUANTITATIVE INHERITANCE, MULTIPLE ALLELES AND PSEUDOALLELES

Units of Instruction

Up to this point, types of inheritance have been considered in which the action of the individual genes involved would be distinguished from genes that possessed only two alternative forms, or alleles. Those traits which are controlled by more than one set of alleles and those which may possess more than two alternative forms will be discussed.

Content:

1. Quantitative inheritance
    - a. Examples in plants
    - b. Examples in man
    - c. Statistical methods
2. Multiple alleles and pseudoalleles
    - a. Multiple alleles
    - b. Pseudoalleles

VII. NATURE AND FUNCTION OF HEREDITARY MATERIAL

Units of Instruction

To understand heredity as a phenomenon of life, there is a need to know how genes act in determining the characteristics they control and how genes replicate themselves to permit transmission for indefinite numbers of cellular or organismal generations. Such an understanding of heredity must rest primarily on a knowledge of its chemical and physical basis.

Content:

1. Nucleic acids
2. Indirect evidence for DNA as the genetic substance
3. Direct evidence for mucleic acids as genetic substance
4. Basic structure of the hereditary material
    a. Basic structure
    b. Nucleosides and nucleotides
    c. Geometric organization of DNA
    d. DNA replication
5. RNA
    a. Ribosomal RNA and ribosomes
    b. Transfer RNA
    c. Messenger RNA
    d. RNA viruses and the replication of RNA
6. Relationship of DNA to RNA, rRNA and tRNA.
7. Protein synthesis
8. Genetic code

VIII. THE NATURE AND CAUSE OF MUTATIONS

Units of Instruction

Mutations are the ultimate source of genetic variation. They constitute the principle raw material with which nature works to bring about evolution. They also provide the principle tools of the geneticist, for only through comparison of alternative states of genes is the geneticist able to gain insight into the structure and function of genes, or, in fact, to even detect a gene. Therefore, for these and other reasons, a student of genetics should have a thorough understanding of the nature and cause of this phenomenon. It is the intent of this unit to impart this knowledge to the student.

Content:

1. Point or gene mutations
2. Chromosomal mutations
    a. Chromosome rearrangements
    b. Loss or addition of whole chromosomes or chromosome sets.
3. Spontaneous verses induced mutations

IX. GENES AND METABOLISM

Units of Instruction

The genetic control of metabolism will be the object of study in this unit. Since most genes influence metabolism through the production of structural and enzymatic proteins, attention will be directed to the effects of the protein produced on cell metabolism.

Content:

1. Factors affecting transcription
2. Factors affecting translation
    a. Role of amino acids in translation
    b. Role of tRNA in translation
    c. Role of the ribosome in translation
3. Gene end products
    a. Hemoglobins and the anemias
    b. Thalassemia

    c. Sickle cell anemia
    d. Hemoglobin C anemia
    e. Tryptophan synthetase
  4. Metabolic pathways and enzyme blocks

X. GENES AND DEVELOPMENT

Units of Instruction

In the previous unit it was shown that genes determine the morophological and physiological characteristics of the organism. In order for these systems to become integrated and function, a high degree of control over gene action is necessary. It is the object of this unit to elucidate the various control mechanisms.

Content:

1. Regulation of DNA replication
2. Regulation of DNA transcription
3. Regulation of mRNA translation
4. Nucleus-cytoplasm interaction
5. Tissue differentiation
6. Organ-system differentiation

XI. BEHAVIOR GENETICS

Units of Instruction

Behavior genetics is the study of hereditary control over an organism's action. The importance of this area is evident when one considers that it is through behavior that the individual is able to obtain food, escape enemies, find a mate, and reproduce. This unit deals with what is known about how genes act to determine behavior patterns.

Content:

1. Studies on single-gene effects
    a. Waltzing in mice
2. Studies on inbred lines
    a. Alcohol preference in mice
    b. Open-field behavior in mice
    c. Fighting behavior in mice
3. Studies involving selection
    a. Selection for maze-learning in rats
4. Role of intermediate systems in behavior
    a. Role of endocrine system in rodent behavior
5. Role of nucleic acids and proteins in learning and memory

XII. EXTRACHROMOSOMAL INHERITANCE

Units of Instruction

To this point it has been assumed that all genes were located on chromosomes contained within the nucleus of the cell. There are, however, "genes" located in other parts of the cell. It has also been assumed that all genetic information resides in the DNA molecule. Recent investigations have shown that under certain circumstances the genetic information may reside in other molecules. In essence this unit covers the exceptions to the classical chromosomal story of genetics heretofore presented in this course.

Content:

1. Inheritance of color in plastids
2. Mitochondria

3. Kappa particles in Paramecium
4. Mate-killer in Paramecium
5. Metagon in Paramecium
6. Sex-Ratio in Drosophila
7. Episomes
8. Extrachromosomal inheritance in Chlamydomonas
9. Shell-doiling in snails as an example of maternal predetermination

XIII. POPULATION GENETICS AND EVOLUTION

Units of Instruction

Up to this point, consideration of the gene has been solely in terms of the individual. One more aspect of the genes should be studied; primarily its distribution in populations. A discussion of genes in populations, especially over a number of generations, will also introduce the subject of evolution.

Content:

1. Genes in populations
    - a. Selection
    - b. Factors modifying selection against a gene
    - c. Interaction of mutation and selection
    - d. Our load of mutations
    - e. Migration
    - f. Genetic drift
2. Race and species formation
    - a. Genetic diversity in Drosphilia populations
    - b. Genetic diversity in human populations

XIV. ADVANCES IN GENETICS

Units of Instruction

This unit examines some recent advances in biological research, particularly genetics and closely allied fields. It deals with the practical and impractical and sometimes frightening, consequences of this research on the future of mankind.

Content:

1. Embryology
   a. Fusion of living human and mouse cells
   b. Growing of mice embryos in artificial wombs
   c. Test tube babies
   d. Modification of the fetal environment both in vivo and in vitro
   e. Sperm banks
2. Genetics
   a. Development of Homo biologicus and Homo superiorus
   b. Breeding of hybrids and specialized mutants for space
   c. Genetic surgery
   d. Unlocking the secrets of DNA
3. Medicine as applied biology and the consequences
4. Questions raised and warnings given
   a. Legal, social, religious and philosophical questions to what the nature of man will be in this kind of world.
   b. Biological consequences of our progress in other fields.

TEXT

Srb, A. M., R. D. Owen and R. S. Edgar. General Genetics.

REFERENCES

Knight, R. L. Dictionary of Genetics

Peters, J. A. Classic Papers In Genetics

Snyder, L. H. and P. R. Davis. The Principles of Heredity.

White, M.J.D. The Chromosomes

INSTRUCTIONAL MEDIA

Abbott Laboratories, Film Service Department, North Chicago, Illinois 60064.

Cell Division And Growth. 16 mm., 13 min., sound, black and white.

Time lapse photography shows cells moving in ameboid fashion developing pseudopods, growing, aligning chromosomes and dividing at maturity.

Bell Telephone Company. Contact nearest telephone company business office.

The Thread of Life. 16 mm., 59 min., sound, color.

Film on genetics and heredity. Illustrates how some characteristics of man, animals and plants are passed from generation to generation.

Coronet Instructional Films, 65 East South Water Street, Chicago, Illinois 60601

Genetics: Mendel's Laws. 16 mm., 13 1/2 min., sound, color.

This film depicts some of Mendel's experiments and clearly explains his laws of dominance, segregation and independent assortment.

Encyclopaedia Britannica Educational Corporation, 1822 Pickwick Avenue, Glenview, Illinois 60025.

Laws of Heredity. 16 mm., 15 min., sound, color.

This film demonstrates how inheritance is determined in statistically predictable ways. It presents the insights and conclusions about inheritance that was first achieved by Gregor Mendel.

Meiosis: Sex Cell Formations. 16 mm., 16 min., sound, color.

Explains how meiosis occurs in the formation of sex cells. Illustrates the sequence of changes that occur in the creation of two daughter cells, each having half as many chromosomes as the parent cell.

Mitosis. 16 mm., 24 min., sound, color.

This film illustrates the fundamental process of cell division in plant and animal life and discusses the importance of the mitotic process to growth and maintenance of an organism.

McGraw-Hill Book Company, Text Film Division, 327 West 41st Street, New York, New York 10036.

Mendel's Segregation. 16 mm., 28 min., sound, color.

Describes Mendel's experiments and explains his law of segregation.

Mendel's Recombination. 16 mm., 28 min., sound, color.

This film uses several crosses to illustrate recombination. Concludes that a genotype results from the assemblage of many genes and that genes are the basis of individuality, of development and of life itself.

ENGLISH COMPOSITION III (GENERAL STUDIES DIVISION)

HOURS REQUIRED

Class, 3.

DESCRIPTION

An advanced course in English Composition developed to provide the student with further insight into the qualities and varieties of expository prose studied initially in the fundamental and intermediate courses of English Composition. Objectives include attempting to develop within the student an individualized, effective style which gives special attention to and emphasizes purpose, tone and audience. Additionally, this course is intended through reading and interpretation to develop an understanding and appreciation of poetry and drama. The conceptual aspects of the course were enhanced through the writing of compositions, class discussions and selected reading assignments.

MAJOR DIVISIONS

	Class Hours
I. Composition and Expository Prose	15
II. Literature Appreciation	18
Total	33

I. COMPOSITION AND EXPOSITORY PROSE

Units of Instruction

1. Development of an expository style which includes graceful, lively, concrete, economical expression;

√

forcefulness and clarity; emphasis, variety and rhythm.

2. Selection of a specific purpose for each composition; blending purpose, central idea, and technique into a unified, effective presentation.
3. Consideration of the audience and accompanying economic, cultural, and philosophic background and predispositions, to achieve a more persuasive composition.
4. Selection of the tone best suited to the idea and audience.
5. Understanding and distinctive stylistic qualities of the authors studied.
6. Development of a style of one's own

II. LITERATURE APPRECIATION

Units of Instruction

1. Understanding and appreciation of poetry and drama through the study of representative types of each genre.
2. Poetry
    a. Reading
    b. Evaluation and interpretation
    c. Discussion
3. Drama
    a. Reading
    b. Evaluation and interpretation
    c. Discussion

TEXT AND REFERENCES

Guth, H. P. A Short New Rhetoric.

Hodges, J. Harbrace College Handbook.

Williams, O. Immortal Poems Of The English Language.

PLAYS SELECTED BY THE INSTRUCTOR

Miller. All My Sons.

Ibsen. Doll's House.

ANIMAL SCIENCE ELECTIVE COURSES

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Laboratory Animal Option

Laboratory Animal Science II 337

Laboratory Animal Diseases 360

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Veterinary Assisting Option

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Surgical Assisting 392

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Unclassified Electives (Either Option)

Food Sanitation and Inspection 408

Histological Techniques 419

Horse Management 427

LABORATORY ANIMAL SCIENCE II

HOURS REQUIRED

Class, 3; Laboratory, 3.

DESCRIPTION

An advanced course in laboratory animal technology designed to provide a functional understanding of selected areas of research utilizing laboratory animals. These include the rather divergent specialties of gnotobiotic (germfree) technology, animal behavior and endocrinectomy surgical techniques.

Consideration is given to the biological uniqueness, research usefulness and future potential of gnotobiotic animals. Information relating to microbiological monitoring, as well as anatomical, physiological and immunological profile data pertaining to germfree animals is also stressed. Nutritional requirements for isolator-housed germfree species are elaborated.

This course also emphasizes information relating to the functional aspects of animal behavior, including patterns and systems of behavior, as well as social relationships most frequently encountered in animal species. The effect of environment particularly on laboratory animals, but with some mention of domestic species is also discussed. Behavioral aspects of the canine and feline species are stressed.

Laboratory emphasis in this course includes primarily the construction, sterilization, populating (with Caesarean derived rodents) and maintenance of germfree isolator equipment. Selected experimental techniques using germfree animals are also developed.

In addition to the laboratory exercises relating to germfree technology, specialized procedures to endocrinectomy surgical techniques in rodents are also developed and practiced.

The necessity for closely supervised instruction in the laboratory aspect of this course, requires that the size of individual sections be limited to 8-10 students. Duplication or replication of each weekly laboratory exercise might then be required depending upon the total number of students in the course.

The diverse nature of the information presented in this course prevents, for the most part, the exact correlation of lecture and laboratory material on a week by week basis.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
A.	Axenic Techniques and Gnotobiology Section		
I.	Introduction to Gnotobiology	1	The eleven laboratory exercises are not designed to correlate with the lecture series. Laboratory sessions are enumerated following lecture outline information.
II.	Theory and Philosophical Aspects of Germfree Life	1	
III.	Essential Terminology (Definitions and Explanations)	1	
IV.	Historical Aspects of Gnotobiology	1	
V.	Classification of Gnotobiotic Animals (by microflora profile).	2	
VI.	Germfree Isolator Equipment	2	
VII.	Methods of Sterilization of Germfree Supplies and Equipment	2	
VIII.	Derivement, Maintenance and Shipment of Gnotobiotic Animals	2	
IX.	Relevance of Gnotobiotic to Barrier Reared (SPF) Operations	2	
X.	Morphological, Histological - Gross Anatomical and Biochemical Profiles Gnotobiotic Animals	2	
XI.	Some Immunological Characteristics of Gnotobiotic Animals	1	
XII.	Determination of Germfree Status	2	
XIII.	Gnotobiotic Animals as Research Tools	1	
XIV.	Outlook for the Future in Gnotobiotic Research	1	

	Class Hours	Laboratory Periods
B. Animal Behavior Section		
I. Introduction to Animal Behavior	1	
II. Behavior Patterns	1	
III. Systems of Behavior	1	
IV. Social Relationships	2	
V. Locality and Behavior	1	
VI. The Effects of Environment on Laboratory and Domestic Animals	2	
VII. Behavior in Dogs	2	
VIII. Behavior in Cats	2	
Totals	33	11

I. INTRODUCTION TO GNOTOBIOLOGY

II. THEORY AND PHILOSOPHICAL ASPECTS OF GERMFREE LIFE

Units of Instruction

1. Pure culture techniques (Pasteur)
2. Open and closed systems
3. Technical and biological approaches

III. ESSENTIAL TERMINOLOGY (DEFINITION AND EXPLANATION)

Units of Instruction

1. Axenic animals
2. Gnotobiotic animals
3. Customized flora animals
4. Maximum barrier (specific pathogen free) animals
5. Medium barrier (high grade conventional) animals
6. Conventional quality animals

IV. HISTORICAL ASPECTS OF GNOTOBIOLOGY

Units of Instruction

1. First developmental period (1880-1915)
    - a. Schottelius (sterile room)
    - b. Nuttell and Thierfelder (germfree bell-jar)
    - c. Cohendy (sterile cylinder)
    - d. Kuster (isolator and lock)
2. Second developmental period (1915-1948)
    - a. Glimstedt (germfree guinea pigs)
    - b. Gustafson (germfree rats)
    - c. Reyniers
        - 1) University of Notre Dame (Lobund Institute for Germfree Studies) 1928
        - 2) Director, Lobund Program. To investigate:
            - a) Instrumentation
            - b) Methodology
            - c) Description of germfree life
            - d) Experimental exploitation of germfree animals
            - e) Establishment of a center for germfree studies
        - 3) Stainless steel rearing chambers (Reyniers units)
3. Third developmental period (1948-present)
    - a. Reyniers (Director, Lobund Institute) to 1959
    - b. Trexler (plastic isolator equipment)
    - c. Wostman (nutrition of germfree animals)
    - d. Pleasents (hand rearing techniques)

e. Gordon (germfree surgery)

f. Luckey (biochemistry of germfree animals)

V. CLASSIFICATION OF GNOTOBIOTIC ANIMALS (BY MICROFLORA PROFILE)

Units of Instruction

1. Alpha gnotobiotes
2. Beta gnotobiotes
3. Gamma gnotobiotes (monobiotes-dibiotes)
4. Delta gnotobiotes (tribiotes-polybiotes)

VI. GERMFREE ISOLATOR EQUIPMENT

Units of Instruction

1. Physical barrier theory
2. Germfree isolator development
    a. Stainless steel isolator (Reyniers unit)
        1) RSU - rearing isolator
        2) REXU - examining isolator
        3) ROPU - surgical isolator
        4) RTRU - transport isolator
    b. Flexible plastic isolator (Trexler)
        1) Small rectangular units (2' to 6' lengths)
        2) Jacket isolator
        3) Surgical unit
        4) Isolation unit (Human)
        5) Other design possibilities
    c. Rigid plastic isolator (plexiglass construction)

VII. METHODS OF STERILIZATION OF GERMFREE SUPPLIES AND EQUIPMENT

Units of Instruction

1. Autoclave (high vacuum type)
    a. Feed, bedding and other supplies

2. Gas Sterilization (ethelene oxide)
    a. Items which cannot be chemically or steam sterilized
3. Chemical sterilization
    a. Peracetic acid
        1) For sterilization of stainless steel, plastic, glass or rubber fabricated equipment
4. Dry heat
    a. Hot air oven
        1) For sterilization of isolator filters
5. Ultra filtration
    a. Ultra filter equipment
        1) For sterilization of heat labile fluids
6. High energy electron beam
    a. Van de Graaf accelerator
        1) For sterilization of food
7. Germicidal ultra violet
    a. Light fixture tube
        1) For eliminating airborne organisms from large (or restricted areas

VIII. DERIVEMENT, MAINTENANCE AND SHIPMENT OF GNOTOBIOTIC ANIMALS

Units of Instruction

1. Derivement methods for germfree animals
    a. Caesarean surgical procedures
        1) Mice
        2) Rats
        3) Guinea pigs
        4) Dogs
        5) Primates
        6) Larger species (domestic animals)

- b. Rearing methods
  - 1) Foster suckling on lactating female
  - 2) Hand rearing techniques (various species)
    - a) Recommended liquid diets
    - b) Feeding equipment
    - c) Hand feeding techniques
    - d) Recommended quantities per feeding
    - e) Problems involved with hand feeding
- c. General characteristics of germfree animals
- d. Basic differences between gnotobiotic and conventional species
  - 1) Body size
  - 2) Abdominal and cecal size
  - 3) Tumor incidence
  - 4) Life span
  - 5) Intestinal flora
  - 6) Lymphoid tissue
  - 7) Immunological
  - 8) Other differences

2. Gnotobiotic isolator maintenance
   - a. Construction and sterilization of isolator
   - b. Preparation of isolator after sterilization
   - c. Processing and sterilization of supplies
     - 1) Food
     - 2) Water
     - 3) Other
   - d. Entry of supplies
   - e. Entry of animals

    - f. Maintenance techniques
        - 1) Cleaning, watering, feeding and others
        - 2) Breeding methods
        - 3) Weaning of offspring
        - 4) Exit of weaned animals
        - 5) Exit of other materials
    - g. Transfer techniques between isolators
    - h. Other miscellaneous procedures
- 3. Problems associated with gnotobiotic production
    - a. Physical difficulties (cecal size)
    - b. Nutritional (oversterilization of feed)
    - c. Strain variations
    - d. Absence of flora
    - e. Reduced growth rate (same species)
    - f. Brittle bones and other abnormalities
- 4. Shipment of gnotobiotic animals
    - a. Specialized equipment for self-contained operation
    - b. Shipping isolators and protective covers
    - c. Shipment by personal vehicle (truck or station wagon)
    - d. Shipment by commercial carrier

IX. RELEVANCE OF GNOTOBIOTIC TO BARRIER REARED (SPF) OPERATIONS

Units of Instruction

1. Methods and techniques utilized in the derivement, housing, maintenance, breeding and production of SPF animals

X. MORPHOLOGICAL HISTOLOGICAL-ANATOMICAL AND BIOCHEMICAL PROFILES OF GNOTOBIOTIC ANIMALS

Units of Instruction

1. Morphological
    - a. Digestive tract
    - b. Endocrine glands
    - c. Lymphoid tissue
    - d. Water content in various organs
2. Histological-anatomical
    - a. Connective tissue
    - b. Smooth muscle tissue
    - c. Epithelial tissue
    - d. Blood values
    - e. Skeletal
3. Biochemistry
    - a. Ammonia content of hepatic portal system
    - a. Urobilin content
    - c. Cholic acid content
    - d. Digestive enzyme inactivation

XI. SOME IMMUNOLOGICAL CHARACTERISTICS OF GNOTOBIOTIC ANIMALS

Units of Instruction

1. Globulins
    - a. Gamma globulin
    - b. Properdin levels
2. Immunological effects of ingestion of dead bacteria
3. Resistance to X-ray exposure
4. Non-specific resistance

5. Role of microflora in certain diseases
    - a. Endoamoeba histolytica
    - b. Trichomonas hominis
    - c. Oral flora (dental caries)
    - d. Tumor development

XII. DETERMINATION OF GERMFREE STATUS

Units of Instruction

1. Microbiological quality control (general)
    - a. Routine culture methods
    - b. Supplemental media
    - c. Tissue culture methods
    - d. Gross microscopic methods
    - e. Other detection techniques
2. Detection methods including determination of various classes of contaminating organisms
    - a. Viruses
    - b. Bacteria
    - c. Yeasts
    - d. Molds
    - e. Actinomycetes
    - f. Rickettsia
    - g. Protozoa
    - h. Helminths
    - i. Arthropods

XIII. GNOTOBIOTIC ANIMALS AS RESEARCH TOOLS (EXAMPLES)

Units of Instruction

1. Microbiological investigations
    - a. Pathogenesis of "L" forms of bacteria

        b. Phagocytosis experiments
        c. Germfree helminth infections
    2. Nutritional investigations
    3. Human medicine
        a. Geriatrics
        b. Cardio-vascular diseases
        c. Hemorraghic shock

XIV. OUTLOOK FOR THE FUTURE IN GNOTOBIOTIC RESEARCH

Units of Instruction

1. Gnotobiotic animals as research standards
2. Space research
3. Advantages in improving conventional animal qualities
4. Other

ANIMAL BEHAVIOR SECTION

I. INTRODUCTION TO ANIMAL BEHAVIOR

II. BEHAVIOR PATTERNS

Units of Instruction

1. Causes of behavior
2. Daily and seasonal cycles of behavior
3. Physiological basis for behavior
4. Environmental modification of behavior
5. Developmental changes in behavior

III. SYSTEMS OF BEHAVIOR

Units of Instruction

1. Ingestive behavior
2. Eliminative behavior
3. Sexual behavior
4. Care soliciting - et epimeletic behavior

5. Care giving - epimeletic behavior
6. Allelo-mimetic behavior
7. Shelter seeking behavior
8. Investigatory behavior
9. Organistic behavior
10. Behavioral disorders

IV. SOCIAL RELATIONSHIPS

Units of Instruction

1. Care-dependency relationships
2. Dominance-subordination relationships
3. Sexual relationships
4. Leader-follower relationships
5. Relationships between species
6. Process of socialization

V. LOCALITY AND BEHAVIOR

Units of Instruction

1. Home range
2. Homing and orientation
3. Migration
    a. Biological clocks - circadian rhythms
4. Territorality

VI. THE EFFECTS OF ENVIRONMENT ON LABORATORY AND DOMESTIC ANIMALS

Units of Instruction

1. Physical environment and behavior
    a. Effects of heat
    b. Effects of cold
    c. Effects of crowding
    d. Effects of odors
    e. Effects of noise

- f. Effects of light
- g. Effects of housing
- h. Effects of nutrition

VII. BEHAVIOR IN DOGS

Units of Instruction

1. Development
    - a. Neonatal and transitional stages
    - b. Period of socialization
    - c. Weaning to sexual maturity
    - d. Adult development and old age
2. Sensory and locomotor capacities
    - a. Olfactory
    - b. Hearing
    - c. Vision
    - d. Locomotor capacities
3. Ingestive behavior
    - a. In the puppy
        - 1) Suckling response
        - 2) Artificial feeding
    - b. In adult dogs
    - c. Intake of fluids
4. Eliminative behavior
    - a. Development in puppies
    - b. Development in adult dogs
5. Sexual behavior
    - a. Development
    - b. Patterns of mature sexual behavior
        - 1) In a managed kennel
        - 2) Free ranging

- c. Factors influencing sexual behavior
    - 1) Physiological factors
    - 2) Prepuberal castration
    - 3) Sexual immaturity
    - 4) Breed differences
    - 5) Dominance relationships
    - 6) Environment
- 6. Maternal behavior
    - a. Pregnancy
    - b. Parturition
    - c. Nursing care
    - d. Weaning
- 7. Social behavior
    - a. Highly social animals
    - b. Establishment of social hierarchy
    - c. Aggression
        - 1) Environmental
        - 2) Inherited

VIII. BEHAVIOR IN CATS

Units of Instruction

- 1. Introductory information
- 2. Developmental processes
    - a. Suckling
    - b. Transitional
    - c. Predatory behavior
- 3. Ingestive and eliminatory behavior
- 4. Sexual behavior
    - a. Males
        - 1) Initiation of sexual behavior

        - 2) In courtship
        - 3) Free ranging
        - 4) Laboratory breeding
    - b. Females
        - 1) Breeding seasons and estrus
        - 2) Trigger ovulation
    - c. Abnormalities
        - 1) Bisexual
        - 2) Hypersexual
        - 3) Autoerotic
- 5. Maternal behavior
    - a. Pregnancy
    - b. Parturition
        - 1) Contraction phase
        - 2) Emergence phase
        - 3) Delivery phase
        - 4) Placental phase
    - c. Maternal care
        - 1) Nursing and retrieving
        - 2) Weaning
- 6. Learning and experience
    - a. Spatial orientation
    - b. Conditioning
    - c. Trial and error (selective learning)
    - d. Observational learning
    - e. Non-specific effects of early experience
    - f. Vocalization

LABORATORY EXERCISES

EXERCISE I INTRODUCTORY INDOCTRINATION AND ORIENTATION RELATING TO GNOTOBIOTIC ISOLATOR EQUIPMENT AND ESSENTIAL ANCILLARY COMPONENTS

1. Identification of isolator types and component parts
2. Operational information
3. Methods of utilization of isolator equipment

EXERCISE II PRACTICE PROCESSING OF SUPPLIES AND INITIATE CONSTRUCTION OF ISOLATOR

1. Processing supplies
    - a. Proper packaging of food and cage bedding material
    - b. Packing supplies into sterilization cylinder
    - c. Processing sterilization cylinder for autoclaving (placement and taping of mylar film)
    - d. Preparation of water bottles (Square Pak Flasks) for autoclaving
2. Initiate construction of isolator sequence
    - a. Prepare isolator bases
    - b. Locate and cut holes in isolator for gloves and door

EXERCISE III CONTINUE ISOLATOR CONSTRUCTION SEQUENCE

1. Install gloves
2. Install door brackets
3. Install isolation door
4. Attach isolator to base
5. Process and sterilize vertical air filter
6. Attach air outlet trap

EXERCISE IV COMPLETE ISOLATOR CONSTRUCTION SEQUENCE AND PREPARE SUPPLIES

1. Attach verticle filter
2. Attach air hose (filter to air pump)
3. Prepare Square Pak Flasks for autoclaving
4. Prepare sterilization cylinders for autoclaving
5. Method of preparing and dispensing peracetic acid

EXERCISE V STERILIZATION TECHNIQUES

1. High vacuum autoclave
   a. Instruction in operational procedures
   b. Sterilization of supply cylinders
   c. Sterilization of water (Square Pak Flasks) without vacuum
2. Assembling of isolator supplies for chemical (peracetic acid) sterilization
3. Chemical sterilization
   a. Peracetic acid sterilization of plastic film isolator and isolator equipment fabricated of stainless steel, plastic, glass or rubber. (All other isolator supplies and equipment are steam sterilized.)

EXERCISE VI OPERATIONAL PHASE OF ISOLATOR UNITS

1. Commence operation of sterilized isolator
   a. Start air system
   b. Process interior of isolator (set up)
   c. Enter supplies from sterilization cylinder
   d. Prepare isolator for entry of animals
   e. Practice (become familiar with) working with hands in isolator gloves
   f. Practice attachment (with plastic sleeve) between separate isolator units

EXERCISE VII SURGICAL (CAESAREAN DERIVEMENT) TECHNIQUE

1. Populate functioning isolators with gnotobiotic mice
   a. Caesarean surgery
   b. Introduction of surgically removed pregnant uterus into surgical isolator
   c. Removal of fetal mice from uterus
   d. Post removal techniques
   e. Transfer of derived animals into maintenance isolators

EXERCISE VIII OPERATIONAL AND MAINTENANCE PROCEDURES IN THE CARE AND HANDLING OF GNOTOBIOTIC MICE IN ISOLATORS

1. Routine procedures
   a. Feeding, watering, cleaning, handling techniques
   b. Entrance of supplies (pass through techniques)
2. Microbiological quality control of isolator equipment
   a. Sampling methods
   b. Sample removal from isolator
   c. Processing of samples (using prescribed techniques) in the microbiology laboratory

EXERCISE IX PRACTICE OF EXPERIMENTAL TECHNIQUES WITH ANIMALS HOUSED IN PLASTIC ISOLATOR EQUIPMENT

1. Routine techniques practiced
   a. Intraorbital bleeding
   b. Injections (various sites) with saline solution
   c. Tail vein bleeding - preparation of blood smear slides for hematological examination
   d. Removal of gnotobiotic mice from isolator - comparison of internal anatomy (cecum-organs) with conventional mice

EXERCISE X BEGINNING OF ENDOCRINE SURGERY LABORATORY SEQUENCE

1. Surgical procedure #1
   - a. Completion of thyroidectomy technique on laboratory rats
2. Surgical procedure #2
   - a. Hypophysectomy surgery technique completed on laboratory rats

EXERCISE XI CONTINUATION OF ENDOCRINE SURGERY LABROATORY SEQUENCE

1. Surgical procedure #3
   - a. Ovariectomy surgical technique completed on laboratory rats
2. Surgical procedures #4 and #5
   - a. Adrenalectomy surgery completed on laboratory rats
   - b. Thymectomy procedures completed on laboratory mice

(All surgical techniques were completed on an individual student basis)

REFERENCES

Any of the following may be selected as a reference for this course.

Fitzgerald, R. J. and E. G. McDaniel. Dental Calculus in the Germfree Rat.

Foster, H. L. The Care and Breeding of a Caesarean Derived Albino Rat Colony.

Gay, W. Methods of Animal Experimentation. Volume I.

Hafez, E.S.E. The Behavior of Domestic Animals

Hickey, John L.S. A Comparison of Current Types of Germ-Free Apparatus

Horton, R. E. and J. L. Hickey. Irradiated Diets for Rearing Germfree Guinea Pigs

Levenson, Stanley N. etal. A Plastic Isolator for Operating in a Sterile Environment

Luckey, T. D. Germfree Life and Gnotobiology

New York Academy of Sciences. Germfree Vertebrates: Present Status

Notre Dame University. Proceedings of the Second Symposium on Gnotobiotic Technology

Reyniers, James A. Germ Free Life Studies, Lobund Report #1

Smith, R. W. Technical Writing

Trexler, P. C. and L. I. Reynolds. Flexible Film Apparatus For the Rearing and Use of Germfree Animals

Turner, R. P. Technical Report Writing

INSTRUCTIONAL MEDIA

Audio-Visual Support Center (forward request to: Commanding General in the U. S. Army area in which the borrower resides)

Animals For Research. 16 mm., 28 min., sound, color. Describes the procedures and techniques employed in breeding disease free animals for use in scientific research projects. It also involves techniques and equipment used in maintaining a disease free colony and the transportation of the animals to research laboratories.

Use of Germfree Animals In Research. 16 mm., 47 min., sound, black and white.

Dr. Thomas G. Ward discusses the production, types, characteristics, maintenance, commercial availability and uses of germfree animals. The necessity of special equipment and the requirements for its absolute sterilization are emphasized. The potential uses of germfree animals are also discussed.

Encyclopaedia Britannica Educational Corporation, 1822 Pickwick Avenue, Glenview, Illinois 60025

Endocrine Glands. 16 mm., 11 min., sound, black and white.

Demonstrates the vital importance of various glands of internal secretion including the pituitary, thyroid, parathyroid and pancreas.

Hazleton Laboratories, Box 30, Falls Church, Virginia.

Caesarean Derivement of a Macaca Mulatta Monkey Into A Germfree Environment. 16 mm., 12 min., silent, color.

Film shows the methodology involved in the surgical isolator Caesarean derivement of a Macaca Mulatta monkey into germfree maintenance isolator equipment. Nutritional requirements and maintenance procedures of the neonate in a germfree environment are shown.

McGraw-Hill Book Company (Text Film Division) 327 West 41st Street, New York, New York. 10036

Endocrine Glands - How They affect You. 16 mm., 20 min., sound, black and white.

All the endocrine glands are explained with the help of animation. Each endocrine gland is located and the function of its important hormones is clearly shown.

National Medical Audiovisual Center (Annex), Station K, Atlanta
Georgia 30324

Germfree Animals in Medical Research. 16 mm., 19 min., sound, color.

Shows the kind of equipment necessary to carry on germfree investigations; demonstrates the usefulness of germfree animals and includes studies in host-parasite relationships in the absence of bacteria. Serological studies and behavior of viruses in germfree animals are also discussed.

Plastic Isolators; New Tools For Medical Research. 16 mm., 14 min., sound, black and white

Demonstrates how inexpensive plastic isolators will protect laboratory animals from contamination during research studies. These isolators are also used to protect personnel from virulent organisms, noxious fumes and radioactive dust.

Syracuse University Film Library, Syracuse, New York (or may be available through local film distributors)

NBC Animal Secrets Film Series (nine films available on various aspects of animal behavior) Each is 16 mm., 24 min., sound, color or black and white.

LABORATORY ANIMAL DISEASES

HOURS REQUIRED

Class, 2; Laboratory, 2.

DESCRIPTION

An advanced course structured to provide students specializing in laboratory animal science with background and current information pertaining to disease conditions and remedial health practices relating to a variety of laboratory animal species.

Various factors which relate to the occurance of disease conditions and subsequent transmission in laboratory species is discussed in lectures along with etiologic agents involved in the more important bacterial, viral and parasitic diseases of laboratory animals. Environmental, nutritional and clinical procedures relating to control and/or elimination of diseases is also elaborated.

The laboratory exercises are designed for the purpose of clinical study and examination of a variety of disease conditions present in laboratory species; these include spontaneous and induced neoplastic disease, respiratory and common intestinal infections and others. Vaccination methods for disease prevention are also practiced. The scope of the laboratory sessions is extended by use of audio-tutorial supplements and by field trip visits to commercial laboratory animal breeding facilities and bio-medical research laboratories.

To attain maximum instructional effectiveness in the laboratory portion of this course it is essential that each laboratory section be limited to ten or less students. Depending upon total class size, duplication or replication of each weekly exercise will then become necessary in order to accommodate all students in the class.

This course is designed as a supplement to Laboratory Animal Science I and may be elected to the exclusion of, or be taken simultaneously with, Laboratory Animal Science II.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Introduction to Laboratory Animal Health	1	The Laboratory Exercises are not designed to correlate with lectures. Laboratory sessions are enumerated following lecture
II.	Essential Terminology	1/2	
III.	Disease Classification	1	
IV.	Clinical Indications of Disease In Laboratory Animals	1	
V.	Environmental Factors in Laboratory Animal Diseases	2	
VI.	Apparent vs Inapparent Infection in Animal Colonies	1/2	
VII.	Diseases of Laboratory Mice	2	
VIII.	Diseases of Laboratory Rats	2	
IX.	Diseases of Laboratory Hamsters	1	
X.	Diseases of Laboratory Guinea Pigs	1	
XI.	Diseases of Laboratory Rabbits	1	

XII.	Diseases of Laboratory Cats	2	outline information
XIII.	Diseases of Laboratory Dogs	2	
XIV.	Diseases of Laboratory Primates . . .	3	
XV.	Control and/or Elimination of Disease Conditions in Laboratory Animal Colonies	1	
XVI.	Effects of Animal Quality on Laboratory Experimentation	1	
	Totals	22	11

I. INTRODUCTION TO LABORATORY ANIMAL HEALTH

Units of Instruction

1. Overview of present status relating to quality of laboratory animals used in research
2. The importance of using non-diseased animals for breeding and research purposes.
3. Responsibilities of laboratory animal breeding facilities to bio-medical research
4. Responsibilities of the research investigation in selection of quality animals for experimentation
5. Current developments and techniques relating to improvement of laboratory animal quality
6. Beneficial effects relating to the upgrading of animal quality
    a. Breeding
    b. Research

II. ESSENTIAL TERMINOLOGY

Units of Instruction

1. Definition of terms relating to the field of animal diseases (as per example)
    - a. Definition of etiology
    - b. Definition of symptom
    - c. Definition of disease
    - d. Definition of pathology
    - e. Definition of prognosis
    - f. other applicable terms in addition to the above examples

III. DISEASE CLASSIFICATIONS

Units of Instruction

1. Discussion of endogenous diseases
    - a. Metabolic diseases
    - b. Endocrine diseases
    - c. Neoplastic diseases
    - d. Gerontological diseases
2. Discussion of exogenous diseases
    - a. Non-living agents
        - 1) Mechanical
        - 2) Heat
        - 3) Cold
        - 4) Chemical
    - b. Living Agents
        - 1) Viruses
        - 2) Bacteria
        - 3) Rickettsia

        - 4) Fungi
        - 5) Parasites

IV. CLINICAL INDICATIONS OF DISEASE IN LABORATORY ANIMALS

Units of Instruction

1. Importance of recognizing normal baseline appearance and function in laboratory animals
2. Factors utilized in determining the general health status and condition of laboratory species
    - a. General considerations
        - 1) Species
        - 2) Sex
        - 3) Color
        - 4) Age
        - 5) Size
    - b. Functional considerations
        - 1) Condition
            - a) Abnormalities of fecal discharge
            - b) Lack of appetite
            - c) Breathing interval
        - 2) Temperament
            - a) Listlessness
            - b) Inactivity
        - 3) Skin
            - a) Roughed hair coat
            - b) Color of mucous membranes and skin
        - 4) Conjunctiva
            - a) Watering or dull eyes
            - b) Presence of discharge

        - 5) Temperature
            - a) Abnormal temperature
            - b) Dry and/or hot feel of nose
            - c) Discharge from nose
3. Importance of animal technician to be perceptive in learning to recognize disease in laboratory animals
    - a. Cultivation of senses - learning to hear, see, feel and smell in order to judge the appearance of disease conditions

V. ENVIRONMENTAL FACTORS IN LABORATORY ANIMAL DISEASE

Units of Instruction

1. Environmental stress in animal disease
2. Aspects of environment which may affect the health of laboratory animals
    - a. Temperature
    - b. Relative humidity
    - c. Air conditioning and ventilation
        - 1) Air changes per hour
        - 2) Recirculated air
        - 3) Level of filtration
        - 4) Complete fresh air system
        - 5) Drafts
    - d. Crowding
    - e. Noise
    - f. Handling
    - g. Nutrition
    - h. Sanitation

VI. APPARENT VS INAPPARENT INFECTION IN ANIMAL COLONIES

Units of Instruction

1. Inapparent infections
    - a. Sub-clinical disease conditions - lack of symptomology
    - b. Activation to clinical level
2. Apparent infections
    - a. Acute infections
    - b. Chronic infection
3. Epidemic and/or endemic disease conditions
4. Remedial and therapeutic measures
    - a. Colony basis
    - b. Individual animal basis

VII. DISEASES OF LABORATORY MICE

Units of Instruction

1. Bacterial
2. Viral (inapparent and apparent)
3. Parasitic
4. Metabolic
5. Nutritional
6. Neoplastic

VIII. DISEASES OF LABORATORY RATS

Units of Instruction

1. Bacterial
2. Viral (respiratory only)
3. Parasitic
4. Metabolic
5. Nutritional

IX. DISEASES OF LABORATORY HAMSTERS

Units of Instruction

1. Bacterial
2. Viral
3. Parasitic

X. DISEASES OF LABORATORY GUINEA PIGS

Units of Instruction

1. Bacterial
2. Viral
3. Parasitic
4. Nutritional

XI. DISEASES OF LABORATORY RABBITS

Units of Instruction

1. Bacterial
2. Viral
3. Parasitic

XII. DISEASES OF LABORATORY CATS

Units of Instruction

1. Bacterial
2. Viral
3. Parasitic

XIII. DISEASES OF LABORATORY DOGS

Units of Instruction

1. Bacterial
2. Viral
3. Parasitic

XIV. DISEASES OF LABORATORY PRIMATES

Units of Instruction

1. Bacterial
2. Viral
3. Parasitic
4. Nutritional

XV. CONTROL AND/OR ELIMINATION OF DISEASE CONDITIONS IN LABORATORY ANIMAL COLONIES

Units of Instruction

1. Microbiological quality control program
    a. Determination of disease conditions
2. Effective sanitation and pest control programs
3. Use of pathogen free feed and bedding materials
4. Animal quarantine procedures
5. Procedures and recommendations for dealing with disease conditions on a total colony basis (rodents)
6. Recommendations for management of disease conditions on an individual animal basis (rabbits, dogs, cats and primates)
7. Upgrading of animal quality through Caesarian derivement and maintenance of animals in maximum or medium barrier facilities
8. Importance of employee training programs.

XVI. EFFECTS OF ANIMAL QUALITY ON LABORATORY EXPERIMENTS

Units of Instruction

1. Criteria for using quality animals in research
    a. Successful completion of research programs
    b. Validity and reproductability of results

    - c. Reduction of experimental variables
    - d. Reduction of animal health services
- 2. More effective experimental models for basic research and long term testing
    - a. Germfree animals
    - b. Barrier reared (SPF) animals

LABORATORY EXERCISES

EXERCISE I INITIATION AND OPERATION OF A MICROBIOLOGICAL QUALITY CONTROL LABORATORY

1. Essential supplies and equipment required
2. Collection or receipt of samples (fecal, tissue, hematological) prior to microbiological processing
3. Methods recommended for processing of samples:
    - a. Bacterial
    - b. Mycological
    - c. Parasitological
    - d. Hematological
    - e. Histological
4. Methods recommended for preparation of laboratory log book and keeping of records
5. Methods for reporting of results

EXERCISE II LABORATORY ANIMAL NECROPSY

1. Selection of animal for necropsy
2. Euthanize
3. Gross dissection
4. Examination of organs, endocrine glands and lymphatics
5. Description of disease condition or abnormality if present

6. Removal of suspect tissue for microbiological and/or histopathological examination

EXERCISE III LABORATORY ANIMAL PARASITOLOGY

1. Examine hair and skin samples from several different species for detection of external parasites
    - a. Identify samples
2. Collect fecal samples from several laboratory species
    - a. Examine and identify ova, if present, by direct smear method.
    - b. Complete flotation technique - make slides and identify ova if present
3. Select laboratory rodent - (or larger species by special arrangement with instructor)
    - a. Euthanize
    - b. Necropsy animals and examine visceral organs and contents of intestinal tract for parasites
    - c. Collect tissue samples, intestinal contents and adult parasitic forms for examination and identification purposes

EXERCISE IV MYCOLOGY: FUNGUS INFECTIONS IN LABORATORY ANIMALS

1. Introduction to laboratory diagnosis of ringworm infections (use of Microsporum and Trichophyton 35 mm. slide sets)
2. Examine laboratory and larger domestic animals (horses and cows), for skin mycotic infections
    - a. Gross examination
    - b. Presumptive diagnosis by use of Woods Lamp

3. Collect skin scrapings from suspect animals
4. Initiate and complete microbiological follow up
    a. Inoculate on mycological media
    b. Complete confirmatory testing

EXERCISE V ONCOGENESIS: (TUMOR STUDY)

1. Procure laboratory mice with spontaneous mammary tumor involvement
2. Euthanize animals and surgically explore and examine tumor site
3. Remove tumor from euthanized animal. Grossly dissect and examine the tumor tissue
4. Select normal mice, rats, hamsters and guinea pigs as tumor cell recipients
5. Process mouse tumor tissue for injection and implantation
6. Using injection and implantation techniques, inoculate the four species of animals with mouse tumor tissue
7. Examine animals weekly over an **six** week period for gross indications of tumor growth in the inoculated species
8. If tumor growth observed or suspected, euthanize and necropsy the animal. Grossly demonstrate tumor tissue if present
9. Necropsy animals not showing gross signs of tumor involvement after **six** weeks and examine grossly
10. Indicate whether tumors were species specific and metastatic activity **(if any)** occurred.

EXERCISE VI FIELD TRIP

1. Organized field trip included visits as follows
    - a. Commercial laboratory animal breeding facility
        - 1) Tour of gnotobiotic and barrier type breeding areas and indoctrination on methods of disease prevention and control in modern breeding operations
        - 2) Tour of microbiological quality control laboratory operated in conjunction with the breeding laboratory facility
    - b. State Health Department Laboratory
        - 1) Tour of laboratory facilities
        - 2) Indoctrination regarding animal diseases

EXERCISE VII RAT AND MOUSE DISEASES

1. Vaccination of mice against ectromelia with vaccinia virus vaccine
2. Demonstration of infantile diarrhea virus syndrome in infant mice
3. Demonstration and presumptive indication, on a gross (live animal) basis, of respiratory disease in mice and rats
4. Ringtail - a metabolic disease of rats
5. Necropsy of rats to demonstrate the involvement and respiratory pathogenesis of PPLO and CRD infections
6. Examination of mice for hepatic and splenic involvement associated with Corynebacterium infections

EXERCISE VIII DISEASES OF GUINEA PIGS AND RABBITS

1. Necropsy examination of guinea pigs for various disease conditions
    - a. Respiratory involvement (pneumonia)
    - b. Cervical lymphadenitis
    - c. Caesous abcesses on lungs, liver and spleen suggestive of Corynebacteria infection
    - d. Intestinal involvement - enlargement of Peyers Patches and mesenteric lymph nodes along with hemorrhagic or hyperemic areas of the intestine suggestive of intestinal pathogenesis
2. Necropsy examination of rabbits for various disease conditions
    - a. Oral papillomatosis of tongue and mouth
    - b. Inflammation of the upper respiratory tract suggestive of snuffles
    - c. Pneumonia
    - d. Involvement of the liver with lesions suggestive of coccidiosis
    - e. Examination of the external genitalia for the appearance of scabby areas representative of vent disease
3. Use of 35 mm. slide study set for discussion of infectious myxomatosis is rabbits

EXERCISE IX DOG DISEASES

1. Necropsy examination of dogs (veterinary supervision)
    - a. Thorough examination of respiratory, digestive, urogenital, lymphatic and endocrine systems for

recognition of gross pathological conditions which are suspected of having a bacterial, viral, mycotic, parasitic or neoplastic etiology

2. Use of 35 mm. slide study set for a descriptive presentation of leptospirosis

EXERCISE X CAT DISEASES

1. Necropsy examination of cats (veterinary supervision)
   a. Thorough examination of respiratory, digestive, urogenital, lymphatic and endocrine systems for recognition of gross pathological conditions which are suspected of having a bacterial, viral, mycotic, parasitic or neoplastic etiology
2. Use of 35 mm. slide set for a descriptive presentation of feline viral rhinotracheitis

EXERCISE XI PRIMATE DISEASES

1. Necropsy examination of a primate animal (veterinary supervision)
   a. Thorough gross examination for various disease and parasitic conditions
      1) Lesions of face and mouth - suggestive of B. virus infection
      2) Respiratory system (primarily lungs)
         a) Lung mites (Pneumonyssus simicola)
         b) Tuberculosis lesions
         c) Pneumonia
      3) Nutritional deficiency (Vitamin C)
         a) Scurvy - bleeding mucus membranes or internal hemorrhage

4) Parasitic
    - a) Nodular worm infection (Oesophagostomum)
    - b) Amoebic dysentary (Endamoeba histolytica)
    - c) Balantidium coli infection
    - d) Strongyloides

2. Use of 35 mm. slide set for a descriptive presentation of naturally occurring B-Virus infection of monkeys

REFERENCES

The following citations are recommended as reference material for this course:

American Association for Laboratory Science. Journal of Laboratory Animal Care.

Carworth Farms. Carworth Quarterly Letter

Charles River Breeding Laboratory. Charles River Digest

Collins, G. (AALAS) Manual For Laboratory Animal Technicians

Conalty, M.L.. Husbandry of Laboratory Animals

Ferris, E. J. and John Q. Griffith. The Rat In Laboratory Investigation

Gay, W. Methods of Animal Experimentation

Gumaer, K. I. Diseases of Laboratory Animals

Habermann, R.T. and F.P.William. The Identification and Control of Helminths In Laboratory Animals

Harris, R.J.C. The Problems of Laboratory Animal Diseases

Institute of Laboratory Animal Resources. Standards For The Breeding and Care of Laboratory Primates

Lane-Petter, W. Animals for Research

Lane-Petter, W. Provisions of Laboratory Animals For Research

Mahanta, K.C. Veterinary Microbiology

Short, D. Woodnott. ATA Manual of Laboratory Animal Practice and Techniques

Wilner, B.I. A Classification of the Major Groups of Human and Other Animal Viruses

INSTRUCTIONAL MEDIA

American Veterinary Medical Association, 600 South Michigan Avenue,
Chicago, Illinois 60605

An Aid to Therapy (Bacterial-Antibiotic Sensitivity Testing)

16 mm., 26 min., sound, color.

Methods of antibiotic sensitivity testing as a guide in making the best use of antibiotic therapy is discussed. The disc test and quantitative tube dilution method are explained in moderate detail.

National Medical Audiovisual Center (Annex) Station K, Atlanta
Georgia 3005

Laboratory Diagnosis of Rabies In Animals, 16 mm., 30 min., sound, color.

Demonstrates the latest laboratory techniques for the examination of animals in the diagnosis of rabies. Shows the preparation of brain impressions, the inoculation of animals, the serum neutralization test and the fluorescent antibody test.

Isolation and Preliminary Identification of Cultures, 35 mm slides (85 frames), commentary (33 1/3 RPM record) color.

Shows methods of isolating and identifying pathogenic Enterobacterioaceae, by cultural, biochemical and serologic methods.

Laboratory Diagnosis of Ringworm In Animals

Part I: Microsporum Infections, 35 mm. slides (47 frames), (commentary - 33 1/3 RPM record) color.

Part II: Trichophyton Infection, 35 mm. slides (60 frames), (commentary - 33 1/3 RPM record), color.

Describes the clinical features of microsporum and trichophyton ringworm infections in animals as well as techniques employed in the detection of ringworm infections.

The Armed Forces Institute of Pathology, Walter Reed Army Medical Center, Washington, D.C. 20305

The following are slide study sets relating to laboratory animal disease conditions. Each set consists of microscopic slides and/or 35 mm slides, demonstrating and depicting accompanying pathological manifestations on a gross, as well as histopathological basis.

Set No. L5663 - Analogous Pathologic Patterns In Man and Animals. 35 mm. slides (86 frames), written commentary, color.

Set No. ML9760 - Feline Viral Rhinotracheitis, 35 mm. slides (27 frames) 4 microscope slides, written commentary, color.

Set No. L7860 - Infectious Myxomatosis In Rabbits, 35 mm. slides (24 frames), written commentary, color

Set No. L8060 - Leptospirosis In Man and Animals, 35 mm slides (41 frames), written commentary, color

Set No. ML6460 - Naturally Occurring B-Virus Infection of Monkeys, 35 mm. slides (25 frames), 12 microscope slides, written commentary, color.

TECHNICAL REPORTING

HOURS REQUIRED

Class, 1; Laboratory 0.

DESCRIPTION

An introductory course in technical reporting designed to emphasize the importance of technical literature in the bio-medical and veterinary fields. In accomplishing this objective the student is required to read and evaluate selected technical papers and in addition receives indoctrination and practice relating to library usage, data retrieval, writing of technical reports and verbal presentation of scientific data.

Lecture periods are used to instruct the student in the methods and preparation of written technical papers as well as techniques recommended for effective oral presentation of reports. Additionally, class discussions involving the evaluation of selected outside readings are included to add perspective and objectivity to the student's understanding of written technical matter. This exercise also provides a basis of comparison which the student needs in his initial attempts at technical writing.

Arrangements made with college library personnel enable the student, on a scheduled basis, apart from regular class hours, to become familiar with routine methods involving the locating and retrieval of scientific data.

Writing practice encompassing each aspect of the technical report is assigned for completion on an outside of class basis.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Introduction to Technical Reporting	1	
II.	Elements of Technical Writing	2	
III.	Preparation of the Technical Report	5	
IV.	Review and Evaluation of Technical Literature	2	
V.	Oral Presentation of Technical Information	1	
	Totals	11	0

I. INTRODUCTION TO TECHNICAL REPORTING

Units of Instruction

1. Justification of the field of technical writing
2. Application of technical communication to the bio-medical and veterinary fields
3. Historical review of data retrieval methods and technical reporting

II. ELEMENTS OF TECHNICAL REPORTING

Units of Instruction

1. Responsibilities of the technical writer
2. Selection of technical style
3. Factors which contribute to effective writing

    - a) Concise language
    - b) Word usage
    - c) Spelling
    - d) Punctuation
    - e) Compound words and derivatives
    - f) Numerals
    - g) Preparation of copy
4. Familiarization with technical reports (distribute selected copies to class for positive and/or negative evalution).

III. PREPARATION OF THE TECHNICAL REPORT

Units of Instruction

1. General considerations
2. Collection of raw data
    - a) Preparation of information (Abstract) cards
3. Structure of the Report
    - a) Preparation of the Title Page
    - b) Preparation of the Abstract for a technical report
    - c) Preparation of the Introduction Section
        - 1) Literature survey
        - 2) Citing references
    - d) Preparation of the Materials and Methods Section
    - e) Preparation of the Results Section
    - f) Preparation of the Discussion Section
    - g) Preparation of the Summary-Conclusion Section
    - h) Preparation of the Bibliography Section
        - 1) General bibliography format

2) Method for citing technical reports

3) Method for citing reference books

i) Preparation and use of the Appendix Section

IV. REVIEW AND EVALUATION OF TECHNICAL LITERATURE

Units of Instruction

1. Reading of selected bio-medical oriented papers and reports
2. Critical review and evaluation of individual sections of assigned reading

   Ex (introduction, materials and methods); also evaluation of total content.

V. ORAL PRESENTATION OF TECHNICAL REPORTS

Units of Instruction

1. Preparation of the oral report
   a) Organization of materials to be presented
   b) Time allotment
   c) Method of delivery
   d) Audio-visual supplementation (films, slides)
2. Recommendations for speaking in public (before a professional group)
3. Importance of personal appearance
4. General considerations
5. Responses during question and answer session at conclusion of oral presentation

REFERENCES

Any of the following bibliographical listings may be used as reference material for this course.

American Institute of Biological Sciences. Style Manual For Biological Journals

Carroll, P. How to Chart Data

Hubbell, G. S. Writing Term Papers and Reports

Smith, R. W. Technical Writing

Turner, R. P. Technical Report Writing

INSTRUCTIONAL MEDIA

National Medical Audiovisual Center (Annex) Station K, Atlanta
Georgia 30005

Medlars, 16 mm., 35 min., sound, black and white

An orientation film on the new medical literature and retrieval system located at the National Library of Medicine.

The Armed Forces Institute of Pathology, Walter Reed Army
Medical Center, Washington, D. C. 20305

Oral Presentation of Scientific Data, 16 mm., 44 min., sound, black and white.

Outlines the steps necessary for the effective and interesting, oral presentation of information at scientific meetings.

The Use of Medical Literature, 16 mm., 53 min., sound, black and white.

Uses of medical literature are discussed along with methods for the conducting of a literature search; the reviewing of handbooks, title lists, indexes, abstracts and card catalogues is included.

ANIMAL HEALTH

HOURS REQUIRED

Class, 2; Laboratory, 2.

DESCRIPTION

A course structured to provide animal husbandry students with the necessary background in animal diseases, their causes, symptoms and prevention. The main concern in today's modern animal agriculture is to keep livestock healthy. Animal diseases cause a loss of millions of dollars each year and with a scarcity of veterinarians in farm practice, it is increasingly more important that the livestock owner be familiar with the measures necessary to prevent animal disease; to recognize the symptoms of disease early and to know when to call for veterinary assistance. The lectures in this course attempt to accomplish the above objectives.

The laboratory exercises are designed to give the student an opportunity to apply the principles learned in lecture to a practical livestock situation. Some of the laboratory exercises aid the student in developing powers of observation as to what is physiologically normal for each species and how to recognize variations from normal in each species. Simple, easily performed diagnostic tests such as taking the temperature, pulse and respiration are conducted. Minor surgical techniques commonly performed by livestockmen are demonstrated. These include dehorning of cattle, castration of cattle, and tail docking of sheep.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	Physical Diagnosis of Variations From the Normal State of Health . . .	3	Laboratory exercises are not designed to correlate with the lecture series. Enumerated following lecture outline.
II.	Diseases of the Digestive Tract	4	
III.	Diseases of the Respiratory System . .	3	
IV.	Metabolic Disorders	3	
V.	Diseases of the Urinary Tract	1	
VI.	Diseases of the Reproductive Organs . .	4	
VII.	Diseases of the New Born and Young . .	1	
VIII.	Mastitis	1	
IX.	Diseases of the Integumentary System .	1	
X.	Vaccination Schedules for Various Species	1	
	Totals	22	11

I. PHYSICAL DIAGNOSIS OF VARIATIONS FROM THE NORMAL STATE OF HEALTH

Units of Instruction

1. Normal physiological parameters of various species
2. Discussion of specific changes in attitude, conformation, stance or locomotion which indicate abnormality in various species.
3. The use of such diagnostic tools as the thermometer, manual palpation, and observation to arrive at a tentative diagnosis of disease.

II. DISEASES OF THE DIGESTIVE TRACT

Units of Instruction

1. Simple indigestion in the bovine

2. Toxic indigestion in the bovine resulting from ingesting large quantities of fermentable concentrates
3. Bloat in the ruminant; its causes and symptoms
4. Traumatic reticulitis in the bovine
5. Colic in the horse; its causes, symptoms and prevention
6. Endoparasitism in domestic animals
7. Intestinal obstruction resulting from volvulus, intussusception or a strangulated hernia.

III. DISEASES OF THE RESPIRATORY SYSTEM

Units of Instruction

1. Strangles in the equine
2. Pneumonias as manifested in various species
3. Pulmonary tuberculosis and its public health significance

IV. METABOLIC DISORDERS

Units of Instruction

1. Milk fever in cattle and other species
2. Acetonemia in cattle
3. Pregnancy toxemia in ewes
4. Hypomagnesemia in cattle

V. DISEASES OF THE URINARY TRACT

Units of Instruction

1. Nephritis in the canine
2. Cystitis in various species
3. Urolithiasis in cattle, sheep, cats and horses

VI. DISEASES OF THE REPRODUCTIVE ORGANS

Units of Instruction

1. Anatomy and physiology of the reproductive tract

2. Problems of difficult birth
    a. Mal presentation of fetus
    b. Conditions requiring caesarean section
    c. How to assist in the birth process and post-natal care of the young animal
3. Accidents resulting from the birth process
    a. Prolapsed vagina
    b. Prolapsed uterus
    c. Calving paralysis
4. Infertility in various species
    a. Cystic ovaries
    b. Anestrous conditions
    c. Failure to detect heat
    d. Endometritis
    e. Various diseases causing sterility or abortion
        1) Vibriosis
        2) Trichomoniasis
        3) Brucellosis
        4) Leptospirosis

VII. DISEASES OF THE NEWBORN AND YOUNG ANIMAL

Units of Instruction

1. Pneumoenteritis complex in calves
2. Omphalophlebitis in the newborn
3. Nutritional disorders in the young
4. Endoparasitism in the young animal

VIII. MASTITIS

Units of Instruction

1. Discussion of economic losses to dairy industry due to mastitis

2. Anatomy and physiology of milk secretion
3. Mechanical factors contributing to mastitis
    a. Improper milking equipment and injuries to teats
4. Bacteriological aspects of mastitis
5. Prevention by proper management and milking procedures
6. Dry cow treatment as a preventative measure

IX. DISEASES OF THE INTEGUMENTARY SYSTEM

Units of Instruction

1. Ringworm in various species
2. Photosensitization
3. Ectoparasitism
4. Allergic dermatitis
5. Endocrine disorders resulting in dermatitis
6. Care of the hoof and a discussion of problems arising from neglect of the hoof
    a. Founder in horses and cattle
    b. Foot rot in cattle
    c. "Grease heel" in horses
    d. Thrush in horses
    e. Overgrown hooves and foot rot in sheep

X. VACCINATION SCHEDULES FOR VARIOUS SPECIES

Units of Instruction

1. Discussion of the process of immunity production
    a. Active immunity
    b. Passive immunity
2. Immunological procedures for:
    a. Horses
    b. Cattle

- c. Hogs
- d. Sheep
- e. Dogs
- f. Cats

LABORATORY EXERCISES

EXERCISE I RESTRAINT OF CATTLE

1. Discussion of reasons for proper restraint
2. Demonstration of essential equipment
3. Demonstration of use of ropes, halters, nose leads and anti-kicking devices allowing one to work with safety around cattle
4. Discussion of the importance of slow, deliberate movement
5. Casting a cow with ropes

EXERCISE II RESTRAINT OF HORSES

1. Discussion of the horse's temperament and how to work safely around horses
2. Demonstration of various restraint devices used on horses
    - a. Twitch
    - b. Sidelines
    - c. Tail tie

EXERCISE III PHYSICAL EXAMINATION OF THE COW

1. Demonstration and student practice in taking temperature and pulse of a cow
2. Examination of the mouth and eyes
3. Examination of the udder
4. Examination of the genital tract

5. Examination of rumen motility
6. Determination of dehydration
7. Getting a urine sample for ketosis test

EXERCISE IV PHYSICAL EXAMINATION OF THE HORSE

1. Demonstration and student practice in taking temperature, pulse, and respiration
2. Examination of various systems for variation from normal with emphasis on visual observation and manual palpation
3. Examination of the feet and legs for soundness

EXERCISE V DEHORNING ADULT CATTLE AND CALVES

1. Equipment used
2. Various techniques of dehorning; advantages and disadvantages
3. Restraint measures used in dehorning
    a. Halters and nose leads
    b. Stanchion
    c. Local anesthesia
4. Demonstration of several dehorning instruments
    a. Keystone dehorner
    b. Roberts calf dehorner
    c. Barns calf dehorner

EXERCISE VI CASTRATION OF THE MALE BOVINE

1. Discussion of reasons for castration
2. Discussion and demonstration of restraint measures required
3. Demonstration of castration, using emasculator
4. Demonstration of elastrator and crushing device which may be used for castration

EXERCISE VII BOVINE FOOT TRIMMING

1. Demonstration of proper bovine foot trimming techniques by a professional foot trimmer
   a. Equipment used
   b. Restraint
   c. Importance of proper foot care

EXERCISE VIII MASTITIS ORIENTATION LABORATORY

New York State mastitis survey personnel demonstrate to the students how the New York State Mastitis Control Program can provide economic savings to the dairy farmer by early detection and prevention of mastitis

1. Discussion of what the survey can do for the farmer
2. Demonstration of taking milk samples
3. Discussion of culturing techniques and their interpretation
4. Demonstration of various milk cultures
5. Demonstration of Whiteside Test

EXERCISE IX DOCKING, CASTRATION AND FOOT TRIMMING OF SHEEP

1. Demonstration of proper handling and restraint
2. Equipment used
3. Demonstration of procedures

EXERCISE X MEDICATION AND FIRST AID

1. Use of the balling gun, drenching bottle and bulb syringe in giving liquid or bolus medication to various species
2. Discussion and demonstration of various medications usually kept on hand for emergency treatment of livestock

EXERCISE XI KEEPING PROPER FARM HEALTH AND PRODUCTION RECORDS

1. Discussion of the importance of good farm records
2. Demonstration of the farm individual record system used at Delhi College

REFERENCES

No text was used but the following may be selected as references

American Veterinary Publications. Diseases of Cattle.

Blood, D. C. and J. A. Henderson. Veterinary Medicine.

Dunne, H. W. Diseases of Swine.

Marsh, H. Sheep Diseases.

Udall, D. The Practice of Veterinary Medicine.

United States Department of Agriculture. Animal Diseases.

INSTRUCTIONAL MEDIA

Cornell University Film Library, Ithaca, New York

Exposed - Brucellosis in Problem Herds. 16 mm., 15 min., sound, color.

This film is a case history of a "hidden brucellosis shedder" and how this cow is located in a problem herd.

Hidden Menace. 16 mm., 26 min., sound, color.

This film tells the story of the menace of foreign diseases and pests that threaten our agriculture and how the United States Department of Agriculture fights to prevent these incursions.

SURGICAL ASSISTING

HOURS REQUIRED

Class, 1; Laboratory, 2.

DESCRIPTION

A course designed to supply the student with knowledge and practical ability to assist the veterinarian with surgical procedures. Considerable emphasis will be placed on pre-operative patient preparation and post-surgical care. One lecture period weekly will cover the basic surgical principles. Laboratory sections will involve groups of six or seven students each week actually assisting in patient preparation and surgical assisting. Intensive and routine post-operative care will be conducted by this group. The procedure will be recorded on videotape and the tape will be shown and discussed by the remainder of the class during the following week.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. Introduction	1	0
II. Sterile Technique	4	3*
III. Surgical	6	8*
Total	11	11

* Surgery laboratories involve a total concept approach including preoperative, surgical assisting and postoperative care of the patient. Each student will have an opportunity to participate in the total procedure during the term.

I. INTRODUCTION

Units of Instruction

1. History of surgery
    - a. Prehistoric
    - b. Hippocrates
    - c. Semmelweiss
    - d. Pasteur
    - e. Lister
2. Current status of surgery in veterinary medicine
    - a. Small animal practice
    - b. Large animal practice
    - c. Laboratory animal practice

Laboratory Exercises

See sheet at end of lecture series

II. STERILE TECHNIQUE

Units of Instruction

1. Microorganism contamination
2. Sterile equipment
3. Cold sterilization
    - a. General use
    - b. Vegetative bacteria
    - c. Disadvantages
    - d. Use in cutting instruments
4. Heat sterilization
    - a. Dry heat
    - b. Moist heat (autoclave)
    - c. Advantages and disadvantages

5. Operating room
    a. Construction
    b. Procedures
    c. Infected wound surgery
    d. Contamination
6. Patient preparation
    a. Clipping surgical site
    b. Surgical scrub
    c. Positioning
    d. Draping

Laboratory Exercises

See sheet at end of lecture series

III. SURGICAL PRINCIPLES

Units of Instruction

1. Preoperative considerations
    a. Emergency surgery vs elective surgery
    b. Clinical pathology examinations
    c. Radiological examinations
    d. Use of antibiotics
    e. Use of adrenocorticosteroids
2. Hemorrhage and hemostasis
    a. Types of hemorrhage
    b. Effects of hemorrhage
    c. Causes of hemorrhage
    d. Natural hemostasis
    e. Artificial hemostasis
    f. Electrocautery and electrocoagulation

  - g. Topical hemostasis
  - h. Coagulants
  - i. Systemic hemostatis agents
3. Wound healing
   - a. Closed wounds (contusions)
   - b. Incisions
   - c. Lacerations
   - d. Punctures
4. General factors in wound healing
   - a. Epithelialization
   - b. Contraction
   - c. Connective tissue repair
   - d. Healing rates
5. Local factors in wound healing
   - a. Blood supply to area
   - b. Nerve supply to area
   - c. Degree of tissue trauma
   - d. Foreign bodies in wound
   - e. Improper closure of wound
6. Systemic factors in wound healing
   - a. General health of animal
   - b. Vitamin deficiencies
   - c. Neoplasia
   - d. Age of patient
   - e. Obesity
   - f. Anemia
   - g. Hypoproteinemia
   - h. Hormonal imbalances

7. Wound infection
    a. Bacterial contamination
    b. Use of antiseptic
8. Wound treatment and protection
    a. Debridement
    b. Use of enzymes
    c. Bandaging procedures
    d. Waterproofing
9. Wound dehiscense
    a. Causes of dehiscense
    b. Signs of dehiscense
10. Sutures and suture patterns
    a. Terminology
    b. Use of sutures
    c. Strength of sutured wound
    d. Absorbable suture material
    e. Silk suture
    f. Cotton suture
    g. Nylon suture
    h. Stainless steel suture
    i. Wound clips
    j. Relative tissue strength
    k. Tensile strength of suture materials
    l. Tissue reaction of suture materials
    m. Interrupted and continuous suture patterns
    n. Mattress suture patterns
    o. Cushing and Connell suture patterns
    p. Purse-string suture patterns

LABORATORY EXERCISES

Each surgery group in this course is involved for one week in an active surgical assisting role. Monday of the week, the group bathes the patient, takes necessary radiographs, takes blood for a complete blood count and any biochemical tests that have been ordered, performs a fecal examination and urinalysis, performs a complete physical examination and gets all of the necessary surgical equipment ready.

Each Tuesday, surgery is performed by the instructor. The student group participated in the surgery and anesthesia of each patient. This entire procedure is recorded on videotape without sound. All post-surgical care is conducted by the individual groups under direct supervision of the veterinarian. Wednesday through Friday (or discharge of the patient), the group performs physical examinations, blood and urine examinations and any post-operative care necessary.

The televised procedure is viewed by the veterinarian and the audio portion is recorded on the tape. This tape is shown via closed circuit campus television during the following week. There are four scheduled showings of each tape. The students enrolled in the course view these tapes weekly and are tested on these as well as the lecture content.

The philosophy behind this method is to give each student a wider range of experience in surgical and anesthetic cases than would be possible otherwise. A lack of sufficient clinical material to give a spectrum of surgica techniques and the assistant's tasks involved with each has resulted in this form of laboratory procedure.

TEXT AND REFERENCES

Archibald, J. Canine Surgery.
Carlson, W. D. Veterinary Radiology.
Catcott, E. J., et. al. Equine Medicine and Surgery.
Catcott, E. J. Canine Medicine.
Epstein, E. Skin Surgery.
Frank, E. R. Veterinary Surgery.
Ginsburg, F. Operating Room Technology.
Jones, B. V. Animal Nursing, Part I.
Jones, B. V. Animal Nursing, Part II.
Leonard, E. P. Fundamentals of Small Animal Surgery.
Magrane, W. C. Canine Ophthalmology.
Mayer, K. Canine Surgery.
Ormond, A. N. Surgery of the Dog and Cat.
Perkins, J. J. Principles and Methods of Sterilization.
Zuckerman, J. Diagnostic Examination of the Eye.

VIDEOTAPES

Vanderhurst, S. R., State University of New York at Delhi, N. Y.
Vanderhurst, S. R. Canine Closed Castration.
Vanderhurst, S. R. Feline Ovariohysterectomy.
Vanderhurst, S. R. Canine Splenectomy.
Vanderhurst, S. R. Lateral Approach to the Femur.
Vanderhurst, S. R. Canine Lateral Thoracotomy.
Vanderhurst, S. R. Equine Castration.

Vanderhurst, S. R. Midshaft Femoral Fracture Repair.

Vanderhurst, S. R. Pectoral Limb Amputation.

Vanderhurst, S. R. Canine Gastrotomy.

Vanderhurst, S. R. Canine Neoplastecomy (Lipoma).

Vanderhurst, S. R. and H. G. Brant. Canine Caesarean Section (Germfree Isolator Surgery)

Vanderhurst, S. R. Canine Ophthalmic Surgery - Lens Removal.

INSTRUCTIONAL MEDIA

American Society for Microbiology, Ann Arbor, Michigan.

Venepuncture. 16 mm., 12 min., sound, color.

Demonstration of correct venepuncture techniques.

Preparing for Surgery. 16 mm., 25 min., sound, color.

Demonstrates correct method of surgical preparation of patients.

Bectin, Dickinson, Inc. Rutherford, New Jersey

Collecting Blood Samples. 16 mm., 20 min., sound, color.

Blood collection by vacutainer specimen tube as opposed to the syringe-needle method.

Davis and Geck, American Cyanamid Co., Danbury, Connecticut

Fundamental Aseptic Techniques. 16 mm., 21 min., sound, color.

Basic techniques in operating room.

Gloving and Gowning for Surgery. 16 mm., 12 min., sound, color.

Standard techniques for preparation for surgery.

VETERINARY SCIENCE

HOURS REQUIRED

Class, 3; Laboratory, 0.

DESCRIPTION

An advanced course designed to encompass essential functional areas and situations relating to veterinary clinical practice. The contents of this course should provide the student desiring employment as a veterinarian assistant with information pertaining to kennel management, breeding, obstetrics, pediatrics, dental hygiene, wound management, bandaging, emergency first aid, practical nutrition of sick and healthy animals, client relationships and various other operational features involved in assisting a practicing veterinarian in a veterinary hospital or clinic situation.

Instructional methods in this course include primarily a lecture-discussion type approach without rigidly structured parameters. The course is taught by a trained veterinarian with experience in hospital-clinical practice. Since this course is taught in the final term of the second year, it is intended to maximize the effectiveness of the student anticipating employment immediately after graduation as a veterinarian assistant.

MAJOR DIVISIONS

		Class Hours
I.	Infectious Diseases	10
II.	First Aid	4
III.	Principles of Animal Care	5
IV.	Small Animal Reproduction	3
V.	Exotic Animals	4
VI.	Dentistry	1
VII.	Client Relationships	4
VIII.	Unclassified General Topics	2
	Total	33

I. INFECTIOUS DISEASES

Units of Instruction

1. History of veterinary clinical diseases
2. Canine distemper
3. Infectious canine hepatitis
4. Leptospirosis
5. Rabies
6. Feline panleukopenia
7. Feline respiratory viral diseases (pneumonitis)
8. Canine infectious tracheobronchitis

II. FIRST AID

Units of Instruction

1. Situations requiring first aid
    a. Types of accidents
    b. Clinical examples
2. Hemorrhage
    a. Arterial bleeding

- b. Venous and capillary bleeding
- c. Emergency treatment

3. Shock
    - a. Circulation failure
    - b. Clinical signs
    - c. Emergency treatment
4. Fractures
5. Wounds
    - a. Closed wounds
    - b. Open wounds
6. Burns
    - a. Types
    - b. Treatment
7. Poisoning
    - a. Signs
    - b. Emergency treatment
    - c. Arsenic
    - d. Warfarin
    - e. Phosphorus
    - f. Lead
    - g. Alkali
    - h. Strychnine

III. PRINCIPLES OF ANIMAL CARE

Units of Instruction

1. Feeding
    - a. Energy needs
    - b. Basal metabolic rate
    - c. Maintenance diet

    - d. Proximal analysis
    - e. Components in diet
    - f. Age and feeding
    - g. Pregnancy
    - h. Orphan pups
    - i. Geriatric feeding
    - j. Diseased animal feeding
    - k. Hospital feeding
    - l. Meat diets

2. Exercise requirements
    - a. Run exercise
    - b. Decubital ulcers
    - c. Paralytic patients
3. Canine and feline
    - a. Normal feeding patterns
    - b. Feeding schedules
    - c. Diet examples
    - d. Vitamins and minerals
    - e. Oils
4. Harmful feeding practices
    - a. Liver diets
    - b. Canned fish diets
    - c. Raw fish diets
    - d. Raw egg white diets
    - e. Milk in the diet
5. Harmful home remedies
    - a. Aspirin
    - b. Mineral oil

        c. Commercial hairball medicines
        d. Others

IV. SMALL ANIMAL REPRODUCTION

Units of Instruction

1. Reproductive physiology
    a. Canine
    b. Feline
    c. Pseudopregnancy
    d. Birth control
2. Reproductive problems
    a. Female problems
        1) Estrus failure
        2) Short estrus
        3) Hormonal imbalance
        4) Nymphomania
        5) Failure to accept male
        6) Pseudopregnancy
        7) Overproduction
    b. Male problems
        1) Prostatic disease
        2) Cryptorchidism
        3) Balanoposthitis
3. Artificial insemination
    a. Collection
    b. Semen examination
    c. Semen extenders
    d. Insemination

4. Pyometra
    a. Etiology
    b. Clinical signs
    c. Diagnosis
    d. Treatment
5. Eclampsia
    a. Etiology
    b. Clinical signs
    c. Treatment
6. Feline Urolithiasis
    a. Etiology
    b. Clinical signs
    c. Treatment

V. EXOTIC ANIMALS

Units of Instruction

1. Small exotic cats
    a. Vaccination
    b. Pediatrics
    c. Special care
    d. Surgery
2. Primates
    a. Handling
    b. Diet
    c. Primate care (newly arrived animals)
    d. Reproduction
    e. Common diseases
    f. Surgery

3. Other exotics
    a. Raccoon
    b. Skunk
    c. Others

VI. DENTISTRY

Units of Instruction

1. Dentition
    a. Eruption
    b. Dental formula
2. Dental calculi
    a. Serumal calculi
    b. Salivary calculi
3. Extractions

VII. CLIENT RELATIONSHIPS

Units of Instruction

1. Veterinary client relationships
    a. Types of clients
    b. Client psychology
    c. Handling of clients
2. Practice problems and pitfalls

VIII. UNCLASSIFIED GENERAL TOPICS

Units of Instruction

1. Responses and discussion relating to inquiries from students about various aspects of veterinary hospital practice.

REFERENCES

Benjamin, M. M. Outline of Veterinary Clinical Pathology.

Catcott, E. J. Canine Medicine.

Coffin, D. L. Manual of Veterinary Clinical Pathology.

Ginsberg, F. Operating Room Technology.

Haw, P. B., B. L. Oser and W. H. Summerson. Practical Physiological Chemistry.

Jones, B. V. Animal Nursing. Part I.

Jones, B. V. Animal Nursing. Part II.

Nalbandolf. Reproductive Physiology.

Ormond, A. N. Surgery of the Dog and Cat.

Wintrobe, M. M. Clinical Hematology.

Young, W. C. Sex and Internal Secretions.

FOOD SANITATION AND INSPECTION

HOURS REQUIRED

Class, 2; Laboratory, 4.

DESCRIPTION

This course is designed primarily for second year students having completed courses in chemistry, microbiology, anatomy and physiology and who desire to broaden their employment opportunities through orientation to the field of public and environmental health. Since this field offers many employment opportunities, including food, meat and sanitary inspectors, students will find this course to be especially beneficial. Additionally, it may be of considerable interest, as an elective course, to those students involved in training for the food service career field (hotel, restaurant and institutional management type positions).

The course involves inspection enforcement procedures, emphasizing the functional aspects of inspection and the relationship of sanitation and inspection to public health. Principles and practices employed in food and meat processing and plant sanitation are elaborated; these include water supply, waste disposal and control of harmful animal pests and microbes. The epidemiology of water, milk, food, and meat-borne diseases is emphasized throughout the course. Lecture periods are utilized to outline principles of food sanitation and inspection and present other factual information. In addition to staff instructors, guest speakers from the inspection service will contribute their expertise.

Laboratory sessions will serve to illustrate and enlarge upon inspection techniques and relationships to management and operational practices found in the food industry. The instructional process will be further emphasized through class discussion, training films, and the use of 35 mm slide sets, as well as field trips to dairy, food and meat processing plants.

MAJOR DIVISIONS

		Class Hours	Laboratory Periods
I.	The Relationship of Food Inspection to Public Health	1	Laboratory exercises will follow lecture outline.
II.	Inspection Enforcement Procedures and Techniques	1	
III.	Compliance with Regulations	1	
IV.	Water Supply and Water Waste	1	
V.	Washing and Sanitizing Food Equipment .	1	
VI.	Sanitary Production of Market Milk . .	1	
VII.	Epidemiology of Food-borne Diseases . .	3	
VIII.	Insect and Rodent Control	1	
IX.	Food Inspection Reports	1	
X.	Meat Hygiene and Inspection		
	1. General	3	
	2. Meat Inspection Programs in Existence in the United States . . .	1	
	3. Elements of Meat Hygiene	2	
	4. Meat Inspection Laws, Regulations, Meat Inspection Division Handbook and Role of the Lay Meat Inspector . . .	1	
	5. Inspection Techniques and Procedures	4	
	Totals	22	11

I. THE RELATIONSHIP OF FOOD INSPECTION TO PUBLIC HEALTH

Units of Instruction

1. Historical
2. A public health function
3. Control measures
4. Food-borne diseases
5. Sanitary codes

II. INSPECTION-ENFORCEMENT PROCEDURES AND TECHNIQUES

Units of Instruction

1. The inspector sets a good example
    a. Attitude
    b. Appearance
    c. Conduct
2. Inspector's contact with the food processing plant
    a. Management
    b. Plant employees
3. Enforcement techniques
    a. Recognizing unsatisfactory conditions or operations and informing management
    b. Reviewing corrective action or improvement
4. Handling repeated non-compliance situations

III. COMPLIANCE WITH REGULATIONS

Units of Instruction

1. Major goal
    a. There can be no compromise with disease
    b. Basic food law principle - "Caveat Vendor"
2. Powers granted by the people through legislation
    a. State sanitary code

b. Meat inspection law and regulations

c. Can stop operation without due process of law

3. Enforcement and education

4. Characteristics and attitudes of a good inspector or sanitarian

5. Suggestions to effect compliance

IV. WATER SUPPLY AND WATER WASTE

Units of Instruction

1. Water supply systems
2. Violations
3. Techniques of sampling water
4. Industrial wastes
   - a. Pollution effects
   - b. Remedial measures
   - c. Waste treatment

V. WASHING AND SANITIZING FOOD EQUIPMENT

Units of Instruction

1. Washing materials
   - a. Principles of washing
   - b. Role of water
   - c. Properties and characteristics of washing preparations
2. Sanitizing dairy equipment
3. Washing and sanitizing of conventional milk plant and farm equipment
4. In-place cleaning methods
   - a. Barn pipeline systems
   - b. Dairy plant equipment systems
5. Checking pasteurization systems

VI. SANITARY PRODUCTION OF MARKET MILK

Units of Instruction

1. Essential factors in the production of high quality milk
2. Sanitary design of dairy-farm buildings
3. Milking procedures and control of mastitis
4. Bulk tank storage and milk handling methods

VII. EPIDEMIOLOGY OF FOOD-BORNE DISEASES

Units of Instruction

1. The infectious process
2. Intoxications
3. Reservoirs of infection
4. Mode of escape of infectious agent from host carrier
5. Transmission of infectious agent to new host
6. Portals of entry
7. Multiple barriers
8. Vehicles of contagious disease spread
    a. Basic food products
    b. Mishandling of foods or improper preparation
9. Epidemiological studies

VIII. INSECT AND RODENT CONTROL

Units of Instruction

1. Rodents
    a. Prevalence and concern over rat-borne diseases
    b. Specific diseases carried by rats
2. Economic importance of rodents
3. Recognition of signs of the presence of rodents
4. Insect biology and control
    a. Role in disease transmission

        - b. Economic importance
        - c. Control
            - 1) Sanitation measures
            - 2) Insecticides

IX. FOOD INSPECTION REPORTS

Units of Instruction

- 1. Farm sanitation report
- 2. Dairy-plant inspection report
- 3. Food and restaurant sanitation inspection reports

X. MEAT HYGIENE AND INSPECTION

Units of Instruction

- 1. General
    - a. History of meat inspection
    - b. Classification of meat-borne diseases
        - 1) Chemical or toxicological origin
        - 2) Endogenous animal infections
        - 3) Exogenous contamination
    - c. Control measures for meat-borne diseases
- 2. Meat inspection programs
    - a. Federal Meat Inspection Service
    - b. U. S. Army and U. S. Air Force Veterinary Corps
    - c. Federal-state programs
- 3. Elements of meat hygiene
    - a. Ante mortem inspection
    - b. Post mortem inspection
    - c. Reinspection
    - d. Sanitation
    - e. Condemnation and decharacterization of unfit materials

   - f. Adulteration
   - g. Misrepresentation

4. Meat inspection laws and regulations, handbook, and role of the lay-meat inspector
5. Inspection techniques and procedures
   - a. Ante mortem conduct
   - b. Post mortem conduct
   - c. Humane slaughter
   - d. Meat processing and additives
   - e. Types of sausage and meat product labeling

LABORATORY EXERCISES

EXERCISE I INSPECTION AND FIELD TRIP TO THE COLLEGE DAIRY PROCESSING PLANT (ACCOMPANIED BY PUBLIC HEALTH OFFICIAL)

1. Inspect and fill out score sheet
2. Class discussion of the inspection findings

EXERCISE II FIELD TRIP TO COLLEGE DAIRY BARN FACILITIES

1. Inspect and score sanitary condition of barn, cattle, utensils and milk house (with dairy plant inspector)
2. Class discussion of inspection findings

EXERCISE III SELECTED INSTRUCTIONAL FILMS RELATING TO FOOD SANITATION

1. "Cleaning of Equipment and Containers"
2. "Dishwashing Dividends"
3. "Producing Quality Milk"
4. Discussion relating to contents of films

EXERCISE IV FIELD TRIP TO COLLEGE DINING CENTER (ACCOMPANIED BY PUBLIC HEALTH OFFICIAL)

1. Inspect and score sanitary condition of food preparation, storage and serving area of dining hall
2. Class discussion of inspection findings

EXERCISE V SELECTED INSTRUCTIONAL FILMS RELATING TO FOOD SANITATION

1. "Best Food in Town"
2. "Food Preparation"
3. "Kitchen Habits"
4. "Epidemiology of Salmonellosis in Man and Animals"
5. Discussion relating to content of films

EXERCISE VI FIELD TRIP TO FOOD PROCESSING FACILITY - BEECHNUT BABY FOOD PLANT, CANAJOHARIE, NEW YORK

1. Tour plant with food inspection
2. Discuss findings on inspection
3. Complete field trip questionnaire

EXERCISE VII SELECTED INSTRUCTIONAL FILMS RELATING TO MEAT INSPECTION

1. "Your Meat Inspection Service"
2. "Mark of Wholesome Meat"
3. Discussion relating to content of films

EXERCISE VIII VISIT BY NEW YORK STATE MEAT INSPECTION PERSONNEL

1. Kodachrome slide presentation of poor plant conditions that exist without inspection service
2. "Mock" hearing of violators of meat inspection regulations

3. Laws and regulations concerning licensing, inspection of abbatoirs and processing plants

EXERCISE IX VISIT BY NEW YORK STATE MEAT INSPECTION PERSONNEL

1. Meat processing and additives
2. Labeling of meat and meat products
3. Malochite green test for sodium sulfite

EXERCISE X FIELD TRIP TO MEAT SLAUGHTER AND PROCESSING FACILITY
TOBIN PACKING PLANT, ALBANY, NEW YORK

1. Tour plant with federal meat inspector or plant representative
2. Discuss findings of tour with meat inspector
3. Complete answers to field trip questionnaire

EXERCISE XI REVIEW OF FOOD SANITATION AND INSPECTION PRINCIPLES

1. Relation to public health
2. Image and responsibility of the food meat inspector
3. Discussion of good and bad management practices seen in visits to food processing plants during the course
4. Opportunities for two-year trained animal science technicians in the field of food and meat inspection

REFERENCES

American Meat Institute Foundation. The Science of Meat and Meat Products.

American Public Health Association Incorporated. Standard Methods for the Examination of Water and Waste Water.

Brandly, P. J., G. Mizoki and K. Taylor. Meat Hygiene.

Ehlers, V. M. and E. W. Steel. Municipal and Rural Sanitation.

New York State Department of Health. New York State Sanitary Code.

University of Missouri (Extension Division). Handling Prepackaged Meat.

United States Public Health Service. Ordinance and Code.

INSTRUCTIONAL MEDIA

New York State Colleges of Agriculture and Home Economics, Film Library Section, Cornell University, Roberts Hall, Ithaca, New York 14850

Mark of Wholesome Meat, A. 16 mm., 18 min., sound, color. This film shows what it takes to earn the right to display the purple U.S.D.A. "stamp of approval" on canned and packaged meats and meat products. It emphasizes that both American and foreign meats must attain rigid standards before they receive the mark of wholesom meat.

Your Meat Inspection Service. 16 mm., 27 min., sound, color. A film on the Federal Meat Inspection Service. Tells what is behind the famous purple stamp that says and means "U.S. Inspected and Passed." It illustrates ante mortem, post mortem and processing plant inspection.

New York State Department of Health, Film Library, 84 Holland Avenue, Albany, New York 12208

Best Food in Town. 16 mm., 15 min., sound, color.

A comprehensive presentation of proper food sanitation methods, dealing with correct practices in preparation and refrigeration of food, cleaning and sanitization of utensils and personal hygiene.

Cleaning Equipment and Containers. 16 mm., 27 min., black and white, sound.

A training film demonstrating in detail satisfactory methods for the cleaning and bactericidal treatment of cans, bottles, piping and other equipment, following the accepted routine of flush, scrub, rinse and sterilize.

Dishwashing Dividends. 16 mm., 12 min., sound, black and white.

Dishwashing operations are shown in detail. This film is designed to clarify and create interest in better sanitation facilities and procedures in public eating places.

Epidemiology of Salmonellosis in Man and Animals. 16 mm.,

This film shows the complex transmission patterns of salmonellosis from contaminated feeds of animals to foods of humans; significance of human "carriers" among food handlers. Methods of control are suggested.

Food Preparation. 16 mm., 13 min., sound, color.

This training film depicts the important factors involved in the preparation of food in such a manner as to reduce or eliminate outbreaks of food-borne illness.

Kitchen Habits. 16 mm., 12 min., sound, color.

Depicts actual operating conditions in a kitchen; shows importance of good habits related to food sanitation.

HISTOLOGICAL TECHNIQUES

HOURS REQUIRED

Class, 0; Laboratory, 4.

DESCRIPTION

A course designed to train the research and/or diagnostic laboratory oriented student in the procedures and methodology involved in the processing of animal tissues and the preparation of histological slides utilized in studies of microanatomy and histopathology.

The structure of this course excludes formal scheduled lecture periods and places instead, primary emphasis on laboratory indoctrination and practice. Representative techniques in which proficiency must be developed by the student includes collection, preserving, sectioning and staining of normal and diseased tissue. Instruction is also given in the use of the autotechnicon and freezing microtome. Course requirements include the preparation of fifteen acceptable histologic slides representative of fifteen different body tissues.

Due to the present deficiency of histological technicians in hospital, medical and research laboratories, an effort is made to influence the student to select this unclassified elective course as part of the curricular experience.

MAJOR DIVISIONS

	Class Hours	Laboratory Periods
I. Introduction to the Histological Laboratory	0	1
II. Maintaining Efficiency in the Laboratory	0	1
III. Collecting Tissue	0	2
IV. Fixing Tissue	0	1
V. Dehydrating Tissue	0	1
VI. Clearing Tissue	0	1
VII. Infiltrating Tissue	0	1
VIII. Embedding Tissue	0	2
IX. Sectioning Tissue	0	5
X. Mounting Tissue	0	1
XI. Staining Tissue	0	4
XII. Coverslipping Slides	0	1
XIII. Processing Frozen Sections	0	1
Total	0	22

I. INTRODUCTION TO THE HISTOLOGICAL LABORATORY

Units of Instruction

1. Sequence of events in processing tissue (general discussion)
2. Discussion of the uses of histological techniques
    a. A surgical and clinical diagnostic tool
    b. A research tool

Laboratory Exercises

1. Demonstrate the sequence of procedures employed in processing tissue from collection through coverslipping
2. Brief introduction to the equipment used in histotechnique

II. MAINTAINING EFFICIENCY IN THE LABORATORY

Units of Instruction

1. Labeling and record keeping
2. Block storage
3. Slide storage

Laboratory Exercises

1. Demonstrate the various acceptable methods of labeling, record keeping, block storage and slide storage

III. COLLECTING TISSUE

Units of Instruction

1. Discussion of proper methods of collecting tissue
2. Discussion of the importance of gentle handling of tissue

Laboratory Exercises

1. Demonstration of proper collection methods
2. Student participation in the collection of tissue

IV. FIXING TISSUE

Units of Instruction

1. Discussion of the reasons for fixation

2. Discussion of the various fixatives used and the advantages and disadvantages of each
3. Discussion of the various combinations of fixatives employed and the advantages and disadvantages of each
4. How to remove fixatives from tissue prior to further tissue processing

Laboratory Exercises

1. Student participation in tissue fixation

V. DEHYDRATING TISSUE

Units of Instruction

1. Discussion of reasons for dehydration of tissue before further processing
2. Discussion of various chemicals used as dehydration agents

Laboratory Exercises

1. Use of the autotechnicon by the students
2. The student is made aware of the possibility of "hand processing" tissue when an autotechnicon is not available

VI. CLEARING TISSUE

Units of Instruction

1. Reasons for clearing tissue (rendering it transparent and removal of the alcohol)
2. Various clearing agents commonly employed and the advantages and disadvantages of each

Laboratory Exercises

1. Experience in the use of the autotechnicon

VII. INFILTRATING TISSUE

Units of Instruction

1. Reasons for infiltration of tissue
2. Discussion of the mechanics of the paraffin technique

Laboratory Exercises

1. Continued experience in the use of the autotechnicon which is capable of infiltrating the tissue
2. Demonstration of other methods of infiltration such as the use of the vacuum oven

VIII. EMBEDDING TISSUE

Units of Instruction

1. Reasons for embedding
2. Various types of molds used
    - a. Paper boats
    - b. L shaped metal containers
    - c. Commercial products available

Laboratory Exercises

1. Demonstration of the use of paper boats and commercial embedding containers
2. Demonstration of the use of two types of paraffin dispensers
3. Student participation in the above processes

IX. SECTIONING TISSUE

Units of Instruction

1. How to use a rotary microtome

2. Discussion of the difficulties most commonly encountered in cutting ribbons and how to correct each situation

Laboratory Exercises

1. Student practice in cutting sections with the rotary microtome

X. MOUNTING TISSUE

Units of Instruction

1. Use of the waterbath
2. Use of albumen in mounting tissue
3. Use of warming plate in mounting tissue
4. Use of incubator to coagulate the egg albumen on the slide causing the ribbon to adhere firmly to the slide

Laboratory Exercises

1. Student practice in mounting tissue and use of the equipment involved

XI. STAINING TISSUE

Units of Instruction

1. The identification of different tissue components by their color reactions
2. Staining methods
   - a. Vital staining
   - b. Routine staining
   - c. Special staining
3. Types of staining
   - a. Regressive staining
   - b. Progressive staining

4. Staining terminology
5. The chemistry of staining reactions
6. Difficulties in staining
7. Equipment for staining
8. Staining procedure

Laboratory Exercises

1. Student practice in making up staining solutions
2. Student practice in routine staining using hematoxylin and eosin stains

XII. COVERSLIPPING SLIDES

Units of Instruction

1. Purpose of coverslipping
2. Materials used
3. Discussion and demonstration of two methods commonly used

Laboratory Exercises

1. Student practice in using both methods of coverslipping

XIII. PROCESSING FROZEN SECTIONS

Units of Instruction

1. The freezing microtome
2. The cryostat
3. Method of preparing frozen sections
4. Staining frozen sections
5. Mounting technique for free floating sections

Laboratory Exercises

1. Student practice in processing frozen sections

REFERENCES

Brauer Laboratory Directions for Histological Technique.

Davenport Histological and Histochemical Techniques.

Drury and Wallington Carleton's Histological Technique.

Galigher and Kozloff Essentials of Practical Microtechnique.

Humason Animal Tissue Techniques.

Jones, A. W. Microtechnique.

Jones, R. M. Basic Microscopic Technics.

Preece Manual for Histologic Technicians.

HORSE MANAGEMENT

HOURS REQUIRED

Class, 3; Laboratory, 0.

DESCRIPTION

An introductory course designed to acquaint the student with the selection, breeding, training, care, housing and management of light horses. Information relating to the judging and showing of horses is also included. Special emphasis is placed on the evaluation of equine breeds and physical weaknesses attributed to each breed. Equine diseases (bacterial, viral and parasitic) are covered in detail.

The instructional methods relating to this course include field trips to horse breeding farms, demonstrations relating to the showing and judging of horses and selected visual aids.

MAJOR DIVISIONS

		Class Hours
I.	Introduction	2
II.	History of Light Horse Breeds	3
III.	Equine Phenotype	4
IV.	Unsoundness of the Horse	5
V.	Recommended Housing for Horses	3
VI.	Proper Care and Maintenance of the Light Horse	6
VII.	Equine Diseases	10
	Total	33

I. INTRODUCTION

Units of Instruction

1. Reasons for and advantages of horse ownership
2. The increasing interest in and popularity of saddle horses
3. Effects of increased interest on the horse industry

II. HISTORY OF LIGHT HORSE BREEDS

Units of Instruction

1. Origin of light horses
2. Origin of draft breeds
3. Outstanding sires in light horse breeds
4. Breed differences and characteristics
5. Light horse registry
6. Tour of local horse enterprises

III. EQUINE PHENOTYPE

Units of Instruction

1. Desirable characteristics of a good saddle horse
    a. Breed differences
    b. Structural differences necessary for different performance
    c. Common structural faults
2. Judging laboratories

IV. UNSOUNDNESS OF THE HORSE

Units of Instruction

1. Unsoundness of the feet
    a. Correct flight path
    b. Correct hoof landing
    c. Anatomy of hooves and fetlock
    d. Sites of possible unsoundnesses
    e. Description and evaluation of common hoof faults

2. Unsoundnesses of the legs
    a. Discussion of natural and artificial gaits
    b. Consideration of the lame leg
    c. Determination of the lame leg
    d. Anatomy of legs
    e. Sites of possible unsoundnesses
    f. Description and evaluation of common leg faults
3. General unsoundnesses of the horse
    a. Heaves
    b. Sweeney
    c. Poll evil
    d. Fistulated withers
    e. Cribber
    f. Roarer
4. Evaluation of unsoundness
    a. Blemish vs unsoundness

V. RECOMMENDED HOUSING FOR HORSES

Units of Instruction

1. Temperature requirements
    a. Effects of clipping
    b. Effects of exercise
    c. Effects of blanketing
2. Housing requirements
    a. Size
    b. Type of structure
    c. Flooring
    d. Automatic feeding and watering
    e. Size and design of stalls
    f. Each student designs a barn facility for housing horses

VI. PROPER CARE AND MAINTENANCE OF THE LIGHT HORSE

Units of Instruction

1. Preventative care
    a. Feet trimming
    b. Worming
    c. Proper inoculations for disease prevention
    d. Care and maintenance
        1) Sanitation
        2) Pasture rotation
        3) Isolation of new animals
        4) Importance of a veterinary health certification

VII. EQUINE DISEASES

Units of Instruction

1. Distemper
2. Lockjaw
3. Anthrax
4. Encephalomyelitis
5. Equine abortion
6. Equine infectious anemia
7. Equine influenza
8. Glanders
9. Navel infection
10. Rabies
11. Internal parasites of horses

TEXT AND REFERENCES

Adams. Lameness in Horses.

Ensminger. Horse and Horsemanship.

Kays. The Light Horse Breeds.

INSTRUCTIONAL MEDIA

Film Library, Department of Communication Arts, Roberts Hall, Cornell University, Ithaca, New York 14850.

Basic Principles of Hunter Seat Equitation. 16 mm., 27 min., sound, black and white (New York State Department of Commerce film).

Horseshoeing. 16 mm., 19 min., sound, color (U. S. Office of Education film).

Introduction to Confirmation. 16 mm., 20 min., sound, color (Portia Mansfield Films).

Morgan Horse. 16 mm., 40 min., sound, color (Morgan Horse Club film).

Quarter Horse Reining. 16 mm., 20 min., sound, color (American Quarter Horse Association film).

Riding High. 16 mm., 18 min., sound, color (Canadian Travel film).